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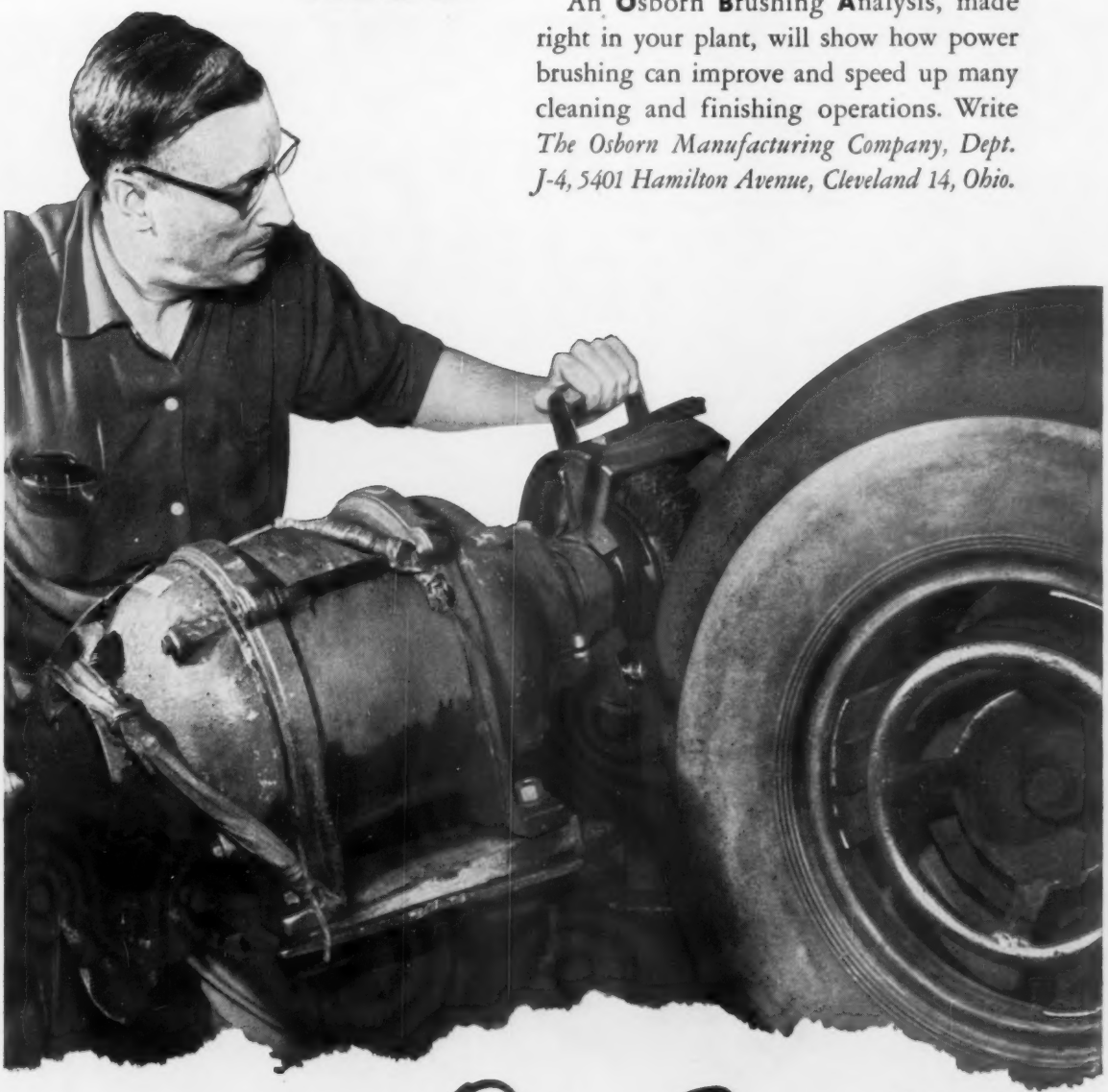

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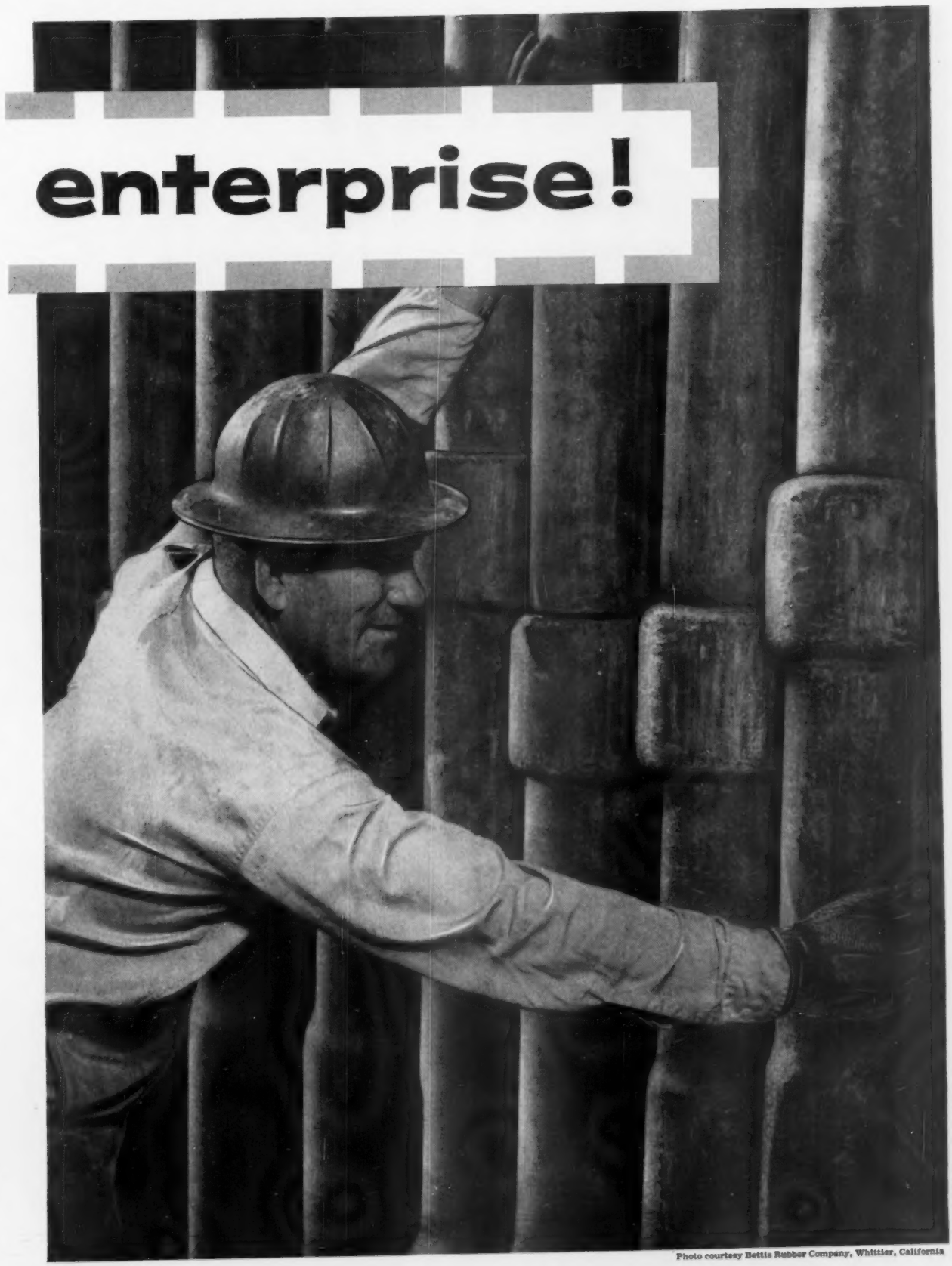

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Erie Press of the Month

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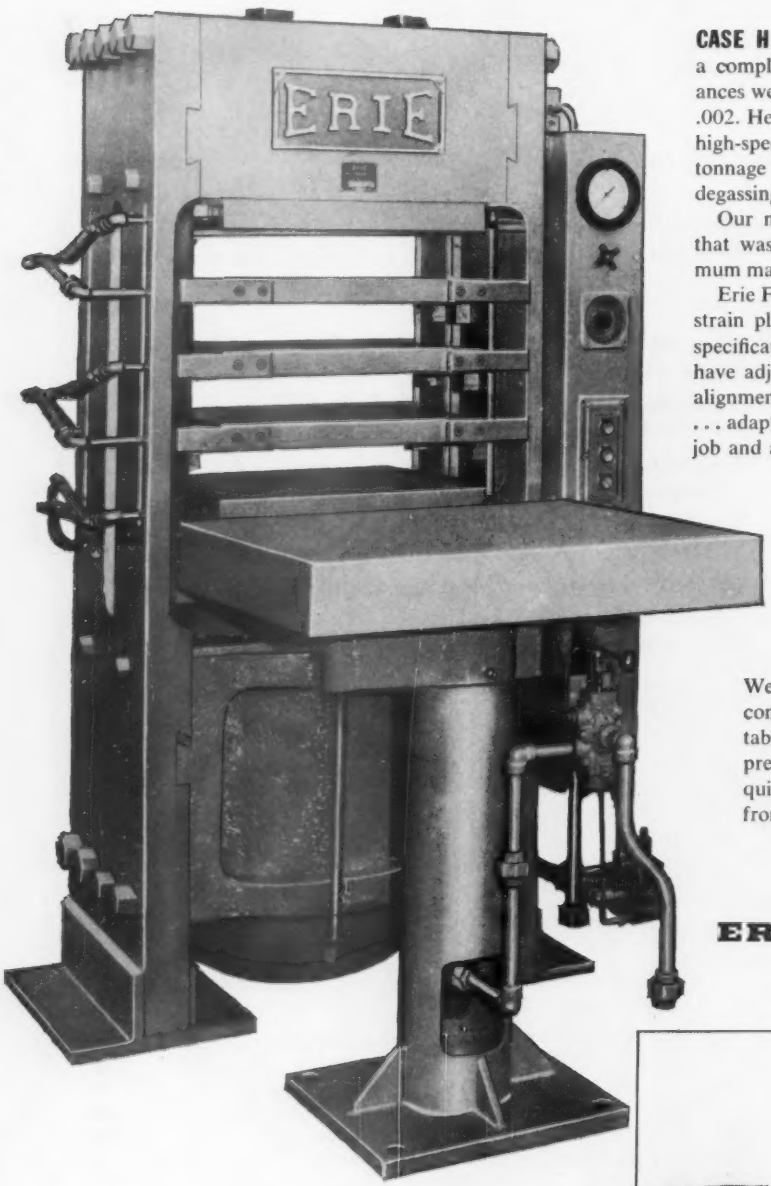

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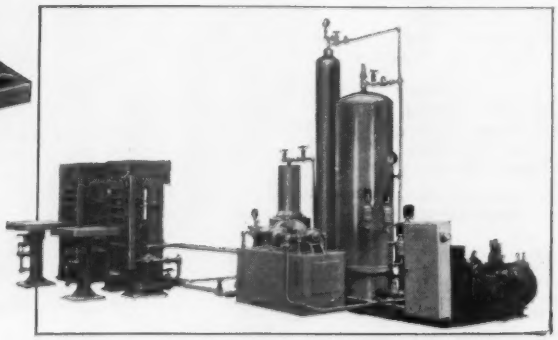

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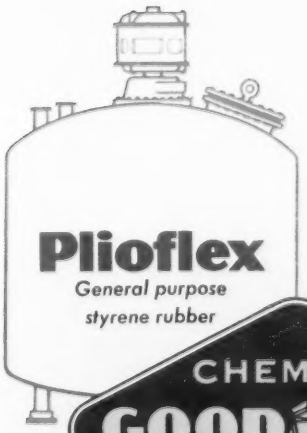

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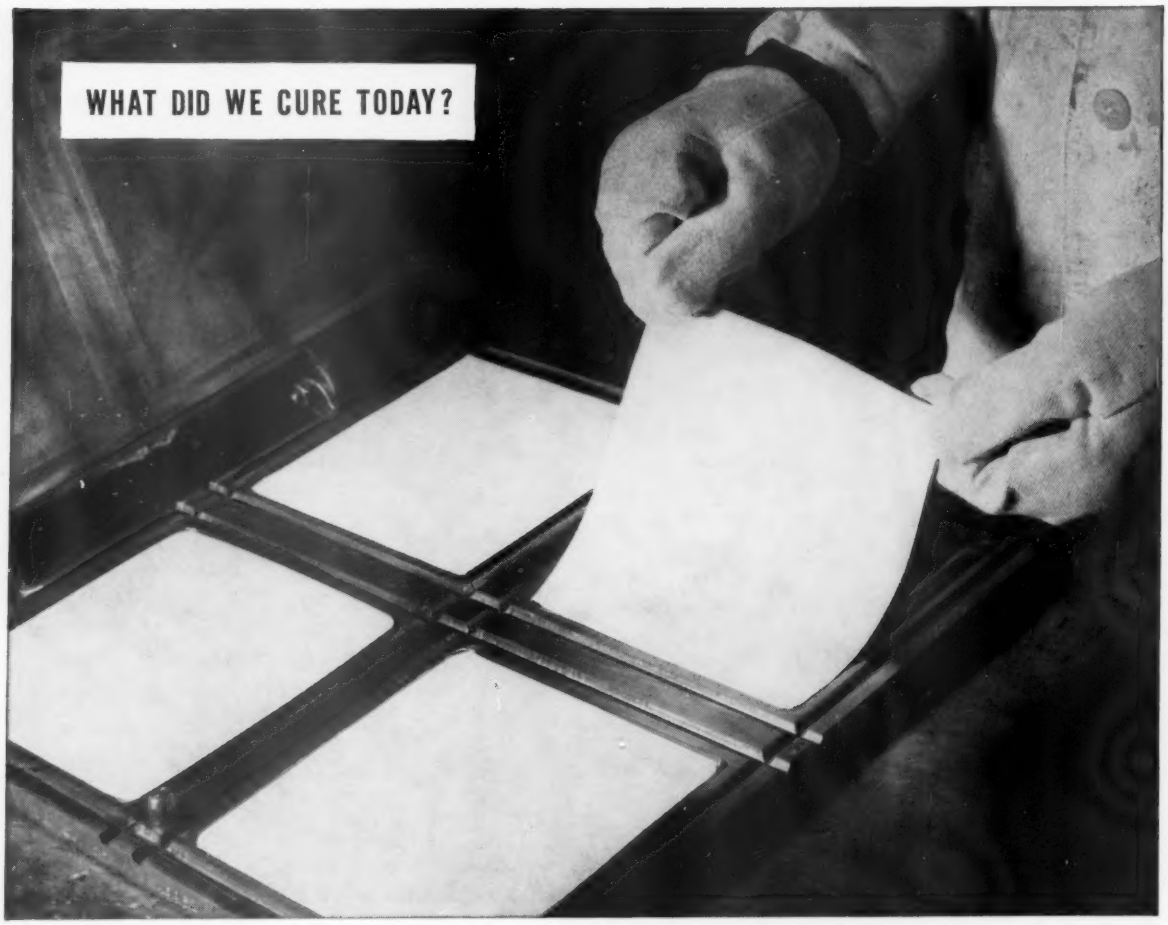

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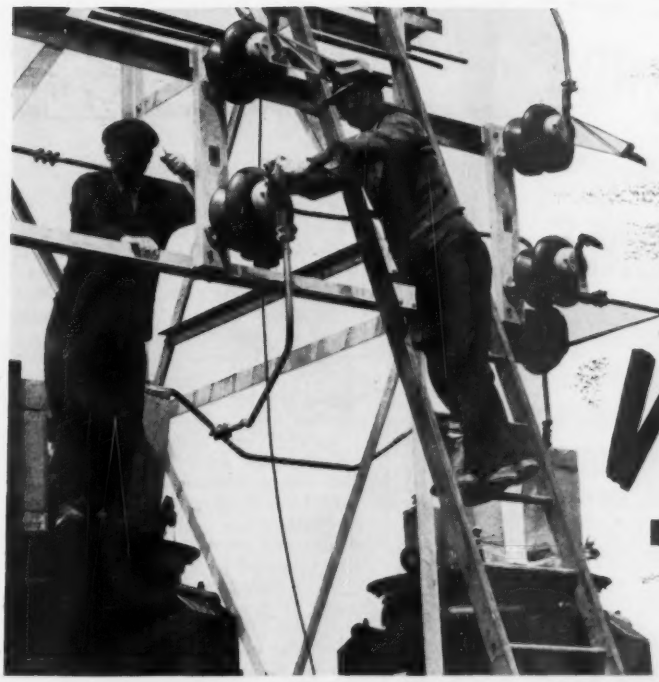

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Letters to the editor

Comments on Capacity

Dear Sir:

With reference to the comment by Mr. C. F. Ruebensaal (RA, January, 1956, p. 490), it is not surprising that some confusion exists regarding the productive capacities of the GR-S type synthetic rubber producing plants since there are so many factors involved such as reactor time and temperature, the types and the number of types being produced, the temperature and speed of the driers, etc.

If a plant were in perfect balance as to polymerization and drying capacities, the total output theoretically could be increased by adding oil and/or carbon black to the limit of the drier capacity and turning out the balance of the reactor capacity in the form of latex. Some consider oil added to a polymer as an extender of the polymer and the resulting product as all "rubber", while some consider it more as an additive to the rubber.

It would seem to the writer that the basic polymerized product might best be termed "net rubber." When oil is added the product could be termed "rubber-plus-oil." As the addition of carbon black is more in the nature of compounding it would appear the product could best be termed "gross masterbatch."

A. E. Bailey

Littlejohn & Co.
New York 5, N. Y.

. . . . . It seems to me proper to refer to the GR-S content of any combination of GR-S and other materials as "net." Likewise, it is useful to refer to total tonnage including all materials combined with GR-S as "gross." These two terms are well understood and should cause no confusion.

My own preference with respect to other combinations is to refer to oil-extended GR-S as "GR-S oil"; a black GR-S mixture as "GR-S black," and if there is a combination of oil, black and GR-S to refer to this as "GR-S oil black."

There is undoubtedly confusion because of the way the term "GR-S" is now used, and in spite of the trade names that are employed a consistent general terminology is important.

R. P. Dinsmore

Vice-President
Goodyear Tire & Rubber Co.
Akron 16, Ohio

. . . . . We agree that the term "net rubber should include oil-extended types and we would also go along with Mr. Ruebensaal's definition of "gross rubber."

J. W. Holmes

Sales Manager
American Synthetic Rubber Corp.
New York 36, N. Y.

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We are writing to you in the hope that you can suggest cheaper molds or advise where we can get information on them.

AARON BAROWAY

Palestine Economic Corp.
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SAMUEL MOLIEN

71 Hartwell Road
Buffalo 16, N. Y.

More Help Needed

Dear Sir:

I wish to obtain information on the preparation, processing and equipment needed to vulcanize new soles or sole recaps for rubber boots or shoes. I would appreciate getting this information in a short form as we already have the general theory on the subject.

JOHN V. MITCHELL

Box 143
Bralorne, B. C.

Memo from the Editor

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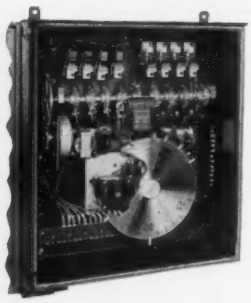

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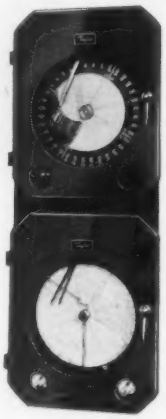

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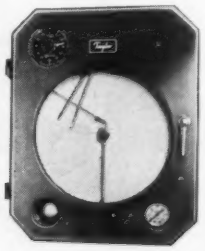

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In addition to reducing fabric purchases, Climco Liners also cut production costs — because they separate perfectly from the stock, down-time due to stock adhesions is eliminated. Tackiness of the stock is preserved, gauges are more easily maintained and latitude in compounding is enlarged. There is no lint or ravelings with Climco Liners and they can be stored horizontally if desired.

Since 1922 Climco Processed Liners have proved their worth to the rubber industry. Give them a trial in your plant.

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Ave. • Cleveland 27, Ohio, U.S.A.
Cable Address: "BLUELINER"

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS
Serving the Industry Since 1921

for best results

use

UNITED

BLACKS

UNITED CARBON COMPANY, INC.

CHARLESTON 27, WEST VIRGINIA

NEW YORK AKRON CHICAGO BOSTON MEMPHIS

DIXIE 35

Dixie 35 (GPF), general purpose furnace, is a remarkably versatile black with properties streamlined in keeping with today's demands.

Dixie 35 was purposely developed to provide the easy mixing, fast processing, and increased reinforcement normally derived from the use of more than one type black.

Dixie 35 has also other desirable features, such as high resiliency, low heat build-up, good flex resistance, and of course exceptional uniformity.

United blacks are quality blacks commanding confidence everywhere because they do such an excellent job.

For product recognition, specify United. You stand to gain so much.

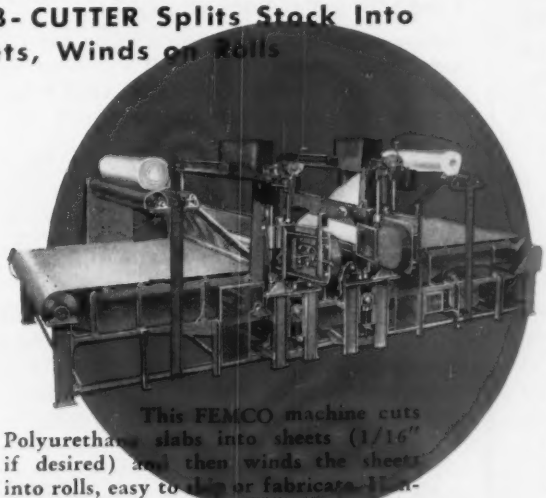
UNITED CARBON COMPANY, INC.

CHARLESTON 27, WEST VIRGINIA

NEW YORK • AKRON • CHICAGO • BOSTON • MEMPHIS

Here's Our New Machine that Levels and Cuts POLYURETHANE SLABS!

DOUBLE-HEAD POLYURETHANE SLAB-CUTTER Splits Stock Into Sheets, Winds on Rolls



This FEMCO machine cuts Polyurethane slabs into sheets (1/16" if desired) and then winds the sheets into rolls, easy to ship or fabricate. Handles slabs 84" wide and 25 feet long *(to 100 feet long when power conveyors are added.)*

With the "two-way" or double-head action of the cutter, stock is cut on both forward and backward movements of the conveyor belt; cutter automatically indexes to meet the stock, which is rolled up at each end of the machine. A slab of polyurethane may be split and rolled in minutes. Wire, write, or call us for details and photos.

SLICES MOST STOCK INTO SHEETS AS THIN AS 1/16 INCH

Yes, with FEMCO'S new Polyurethane Leveling and Splitting machine you can easily reduce bulky polyurethane into thin sheets. Save by buying slab polyurethane and fabricating it yourself. And this one-man operated machine is a real labor saver, too!

"PUSH BUTTON" OPERATION

After machine levels the slab, operator, from "unload" position, pushes a button. The table glides back and forth and the cutting blade does the rest. The table automatically raises and lowers to clear the cutting blade on the backward movement, then indexes to required thickness before the forward movement.

Available in these table sizes: 45" x 64"; 45" x 84"; 64" x 84"; 64" x 96"; 84" x 110".

Wire, write, or call for details.

The FALLS ENGINEERING AND MACHINE CO.

Established 1917

1734 FRONT ST., CUYAHOGA FALLS, O.

NEW Bulletin Tells Why Cab-o-sil® is an Excellent Flow Control Agent for Butyl Rubber Compounds

Cab-o-sil® is one of the most exciting non-black reinforcing pigments ever developed to meet the rigid requirements of butyl and all types of rubber. With a finer particle size (0.015-0.020 micron) than even the finest of rubber reinforcing carbon blacks (0.023 micron) Cab-o-sil is called the SAF — Super Abrasion Furnace — pigment of the silica field. Unique in many respects, it is manufactured by a flame process similar to that used for the production of the highly reinforcing (SAF) carbon blacks and not by the aqueous precipitation process utilized by most silica producers. This results in remarkable properties and functions, and is the reason why Cab-o-sil has proved tremendously effective in all types of rubber compounds.

Almost chemically pure (99.8% silica), and composed of well defined particles of extreme fineness, Cab-o-sil is anhydrous, and has extremely low water adsorption and an enormous external surface area (175-200 $m.^2/gm.$). Cab-o-sil is not a *filler* — it is a *performance controller* — important in amounts as small as 5-7 parts per hundred butyl rubber to the improvement of numbers of compounds.

At low loadings Cab-o-sil performs several important functions in all types of butyl rubber applications. Laboratory and factory tests show that Cab-o-sil can make any and all of the following butyl rubber improvements.

Acts as a thixotropic agent
Eliminates cold flow
Reduces nerve of "green" stock, increasing the extrusion rate in some cases by 400%
Minimizes die swell
Aids dispersion of non-reinforcing fillers such as clay
Gives faster and better dispersion of color pigments
Gives good weatherability, ozone resistance and insulation resistance
Gives high tensile
Gives good stiffening effect
Contributes superior electrical properties

See for yourself how

- 5-7 P.H.R. Cab-o-sil in butyl rubber wire and cable compounds eliminate cold flow, reduce nerve of "green" stock, improve the extrusion rate, minimize die swell, have a definite thixotropic effect, and aid the dispersion of hard clays commonly used in such compounds.
- At low loadings, Cab-o-sil improves color development in weatherstripping and other colored butyl compounds, thereby reducing expensive pigment requirements and also improving extrusion and minimizing cold flow before curing.
- Cab-o-sil lends itself to the new "hot milling" technique by reducing the risk of depolymerization in a properly compounded stock. 12-15 P.H.R. Cab-o-sil give the aforementioned desirable results in wire and cable compounds plus greatly increased tensile strength, good stiffening effect and superior electrical properties. Low loadings of Cab-o-sil also control flow and give good thixotropy and thickening to rubber solutions, neoprene and other rubber-based adhesives.

For recipes, and further information on how Cab-o-sil is being used effectively in small quantities to improve various butyl rubber compounds, send today for the bulletin "Cab-o-sil in Butyl Rubber."

CHEMICAL and PHYSICAL PROPERTIES

Silica Content (Moisture-Free Basis)	*99.0–99.7%*
Free Moisture (105° C.)	*0.2–2.0%*
Ignition Loss (1000° C.)	*0.2–1.0%*
CaO, MgO	*0.00%*
Fe_2O_3	*0.004%*
Particle Size Range	*0.015-0.020 micron*
Surface Area (Nitrogen Adsorption)	*175-200 $m.^2/gm.$*
Specific Gravity	*2.1*
Color	*White*
Refractive Index	*1.55*
pH (10% Aqueous Dispersion)	*4.5–6.0*
Apparent Bulk Density (Compressed Grade)	*6.0–6.5 lbs./cu. ft.*

CABOT. WHITE PIGMENTS DIVISION RA **GODFREY L. CABOT, INC.,** 77 FRANKLIN ST., BOSTON 10, MASS.

Please send me a free sample of Cab-o-sil and a copy of the new bulletin "Cab-o-sil in Butyl Rubber" ((#crub-2)

NAME_____
TITLE_____
COMPANY_____
ADDRESS_____

A sure bet for best release... Dow Corning Silicone Mold Lubricants

Inspector Mike and Moe Muscles have known for years that Dow Corning silicone mold lubricants are by all odds the most efficient *and economical* rubber release agents available. Yet, every now and then they have to prove these advantages. But they're glad of the chance because it's a sure bet.

Experience has taught them that the initial cost of a mold lubricant becomes relatively unimportant when you consider production rates, maintenance, quality, and scrap. Mountains of evidence prove Dow Corning silicone mold lubricants give fast and easy release . . . cut mold maintenance as much as 80% . . . reduce rejects to the vanishing point . . . produce more finished parts with the sharpest detail and finest surface finish. What more could anyone ask?

You, too, can reduce costs and maintain the highest quality by *standardizing* on Dow Corning silicone mold lubricants.

Send coupon today for new booklet describing how silicone mold lubricants serve the rubber industry.

DOW CORNING MIDLAND

first in silicones

DOW CORNING SILICONES

CORPORATION MICHIGAN

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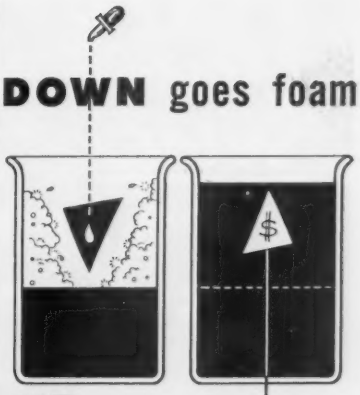
CANADA: DOW CORNING SILICONES LTD., TORONTO. GREAT BRITAIN: MIDLAND SILICONES LTD., LONDON. FRANCE: ST. GOBAIN, PARIS

DOWN goes foam



UP goes production

with Dow Corning Silicone Defoamers

Dow Corning Antifoam A* Compound and Antifoam A emulsions are the most efficient and versatile foam killers ever developed. Thousands of successful applications prove they increase productive capacity, reduce processing time, eliminate the waste and fire hazard of boil-overs. And all three, Antifoam A Compound — Antifoam A Emulsion — Antifoam AF Emulsion, are effective at low concentrations. For example:

One Ounce of Antifoam A Compound kills foam in . . .

- **6,250 lb** Geon latex
- **3,125 lb** butadiene styrene emulsion
- **1,250 lb** neoprene latex

free sample

Test these versatile silicone defoamers at our expense.

SEND COUPON TODAY!

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Dow Corning Corporation
Midland, Mich., Dept. 9204B
Please send me: FREE

Sample of ☐ Antifoam A Compound
☐ Antifoam A or ☐ AF Emulsion;
☐ Booklet on silicone mold lubricants

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COMPANY _____

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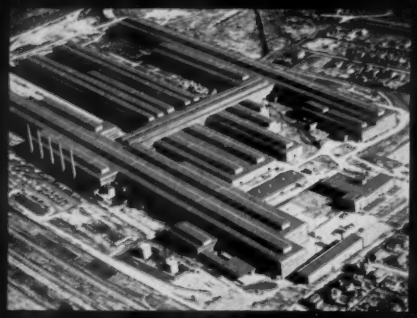
uses professional engineering services

Manufacturers, large and small—in all fields of industry, are turning to professional engineering for better manufacturing methods, improved processing facilities, greater output and lower production costs. For more than thirty years Giffels & Vallet, Inc. has provided a comprehensive planning and engineering service to a widely diversified group of industries.

This service is flexible and adaptable. Whether the project is a complete new plant, or the modernization of present facilities—including process development, equipment design, automated machinery, materials handling flow—Giffels & Vallet, Inc. offers a complete professional service to meet the specific requirements of each individual client. These services are set forth in a special Planning Brochure.

A copy will be mailed on request.



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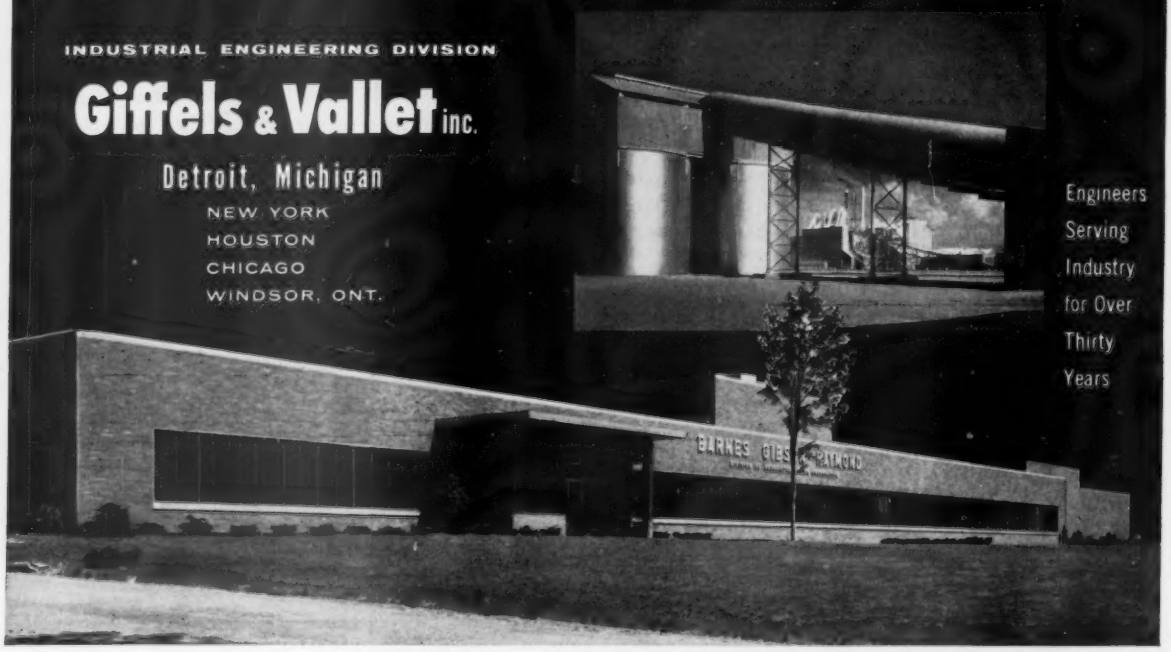
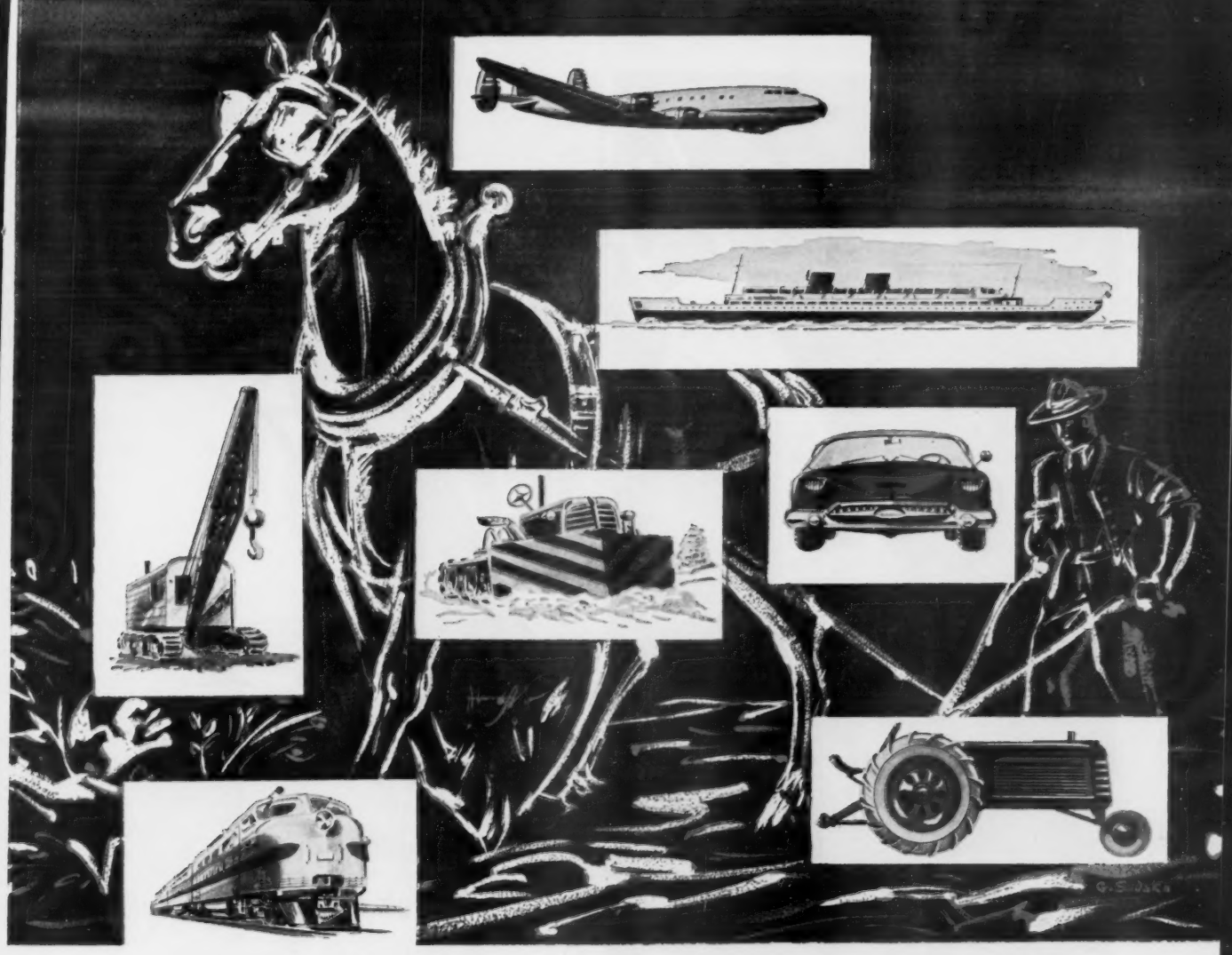


Engineers Serving Industry for Over Thirty Years



The new horsepower needs Paracril!

Steel, rubber, oil, and science have taken the horse out of horsepower—sent Dobbin the way of the kerosene lamp.

The *new* power is oil—oil that burns—oil that drives pistons and turbines in hydraulic systems—oil that lubricates moving parts to give the long reliable life essential to today's power equipment.

And Paracril® is the modern, oil-resistant chemical rubber that's outstanding for its ability to control the power of oil—in gaskets, seals, hydraulic hose and fittings, and a host of other applications where rubber-like properties are required.

Impervious to animal, vegetable, or mineral oils, fats, and greases, Paracril also provides excellent *abrasion resistance*, good *flexibility* over a wide temperature range, great *dimensional stability* and lasting *resilience*.

What's more, Paracril is available in various grades of oil-resistance, in bale or crumb form, and is extremely easy to process. It may be calendered, extruded, molded, or solvated for use in cements and adhesives—blended with plastics or other rubbers to impart special desirable properties.

See how Paracril can be an invaluable plus to *your* rubber products. Learn more about Paracril's many advantages by writing on your letterhead to the address below.

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company, Limited, Elmira, Ontario
RUBBER CHEMICALS • SYNTHETIC RUBBER • PLASTICS • AGRICULTURAL CHEMICALS • RECLAIMED RUBBER • LATICES • Cable Address: Rubexport, N.Y.

DIAMOND CHEMICALS

Diamond Chemicals

In light or black extrusions—Millical® gives you better "body," faster cycle

Looking for an easy mixing pigment that will stop extruded stock from sagging and collapsing in open steam cures? DIAMOND's Millical provides a nonporous excellent "body," due to its fine particle size (1 micron), particle shape and uniformity.

DIAMOND recommends Millical as a primary filler in rubber floor tile, synthetic rubber shoe soles, molded mechanical goods, tubing—anything, light or dark, needing higher shore hardness than ground limestone can provide.

Millical produces smooth extrusions. It calenders very well and improves tensile and tear properties. It will speed up your curing cycle and boost production.

Call your nearby DIAMOND representative today for information and technical help on Millical and other high-grade calcium carbonates. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

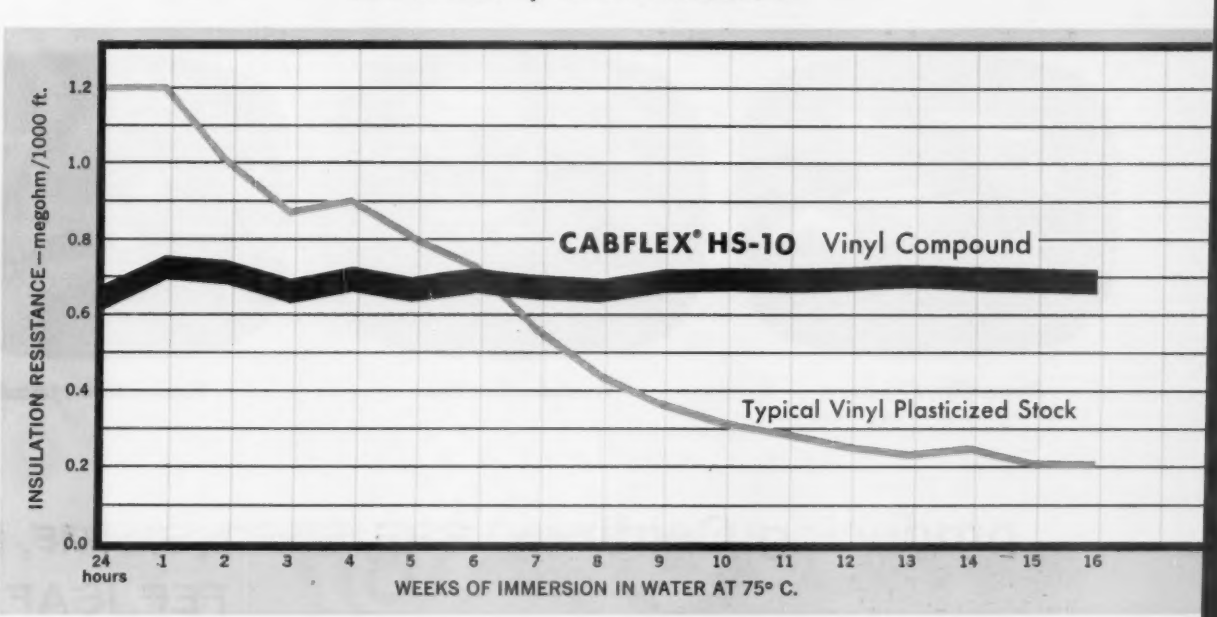
Same high stability and permanence after 16 weeks immersion in hot water

NEW

Cabflex® HS-10

UNIQUE ALKYL ARYL PHTHALATE

A Product of Cabot Research



Cabflex® HS-10, the unique low volatility phthalate plasticizer with excellent processing characteristics, retains its own original high insulation resistance, stability and permanence, and those of the typical vinyl plasticized stock in which it is incorporated, even after 16 weeks of immersion in 75°C. water.

This is just one more reason why you, too, should try NEW CABFLEX HS-10 in your compounds, especially where plastics are exposed to high temperatures and humidities.

CHECK these other advantages of Cabflex® HS-10:

- *Volatility 1/2 that of di-iso-decyl phthalate*
- *Requires no antioxidant*
- *Outstanding insulation resistance in electrical vinyl compounds—13,000 megohm/1000 ft. @ 15.6°C.*
- *Excellent resistance to extraction by gasoline, oil and water*
- *Low rate of migration*
- *Greatly improves processing characteristics while maintaining the permanence of plasticizer systems in blends with polymeric plasticizers*

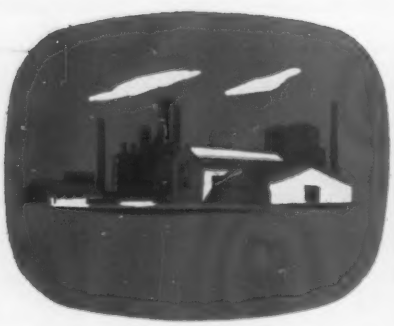
Write for FREE SAMPLES AND TECHNICAL LITERATURE

CABOT PLASTICS CHEMICALS DIVISION

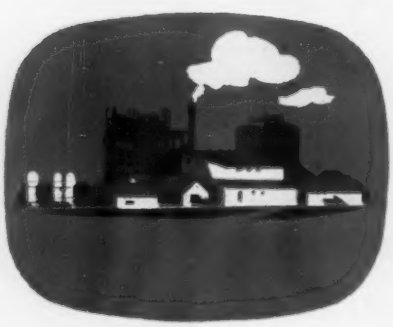
GODFREY L. CABOT, INC. 77 Franklin St., Boston 10, Mass.

WITCO-CONTINENTAL

points the way...
to serve your
carbon black requirements



Ponca City, Oklahoma



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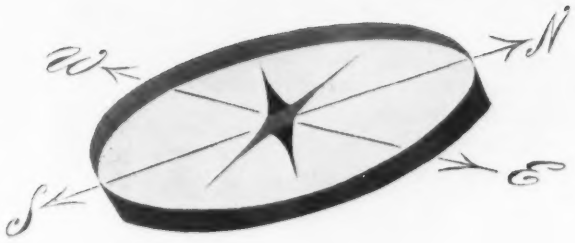
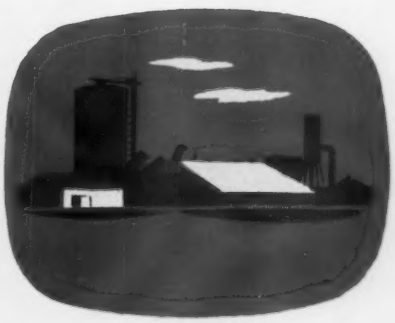
Eunice, New Mexico

...producing Continex® SRF, SRF-NS, HMF, HAF
FEF, ISAF, CF;
Continental® AA, A, F, R-40
rubber blacks



Sunray, Texas



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. . . to solve your rubber problems

Research and Technical Service
Laboratories at
Amarillo, Texas and Akron, Ohio

Technical assistance has always played an important part in Witco-Continental's service to the rubber industry. To provide the utmost in promptness and efficiency, we maintain complete, modern research and technical service facilities. At our Akron laboratory, experienced rubber chemists are available to assist in solving customers' problems relating to carbon black and rubber formulations. At our modern research laboratory in Amarillo, new types of blacks are constantly being developed to help the rubber industries meet demands for new and improved products.

For prompt service in your area, contact your nearest Witco sales office.

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WITCO

36 Years of Growth

Chicago • Boston • Akron • Atlanta • Amarillo • Houston • Los Angeles
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MATHIESON... *quality processed sulphurs for rubbermaking*

DEVIL BRAND

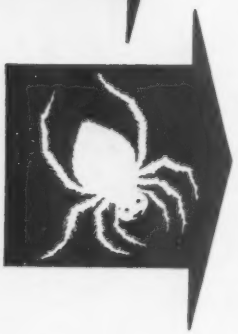
ground crude sulphur
99.5% min. purity
Grade A—90% passing 200-mesh
Grade AA—97% passing 200-mesh
50-lb. triple-wall paper bags

STAR BRAND

ground refined sulphur
99.9%-100% pure
Grade A—90% passing 200-mesh
Grade AA—97% passing 200-mesh
50-lb. triple-wall paper bags

BLACKBIRD BRAND

ground crude sulphur with
.5% carbon black added
99% min. purity
98-100% passing 325-mesh
50-lb. triple-wall paper bags



SPIDER BRAND

ground crude sulphur
with conditioner added
97% min. purity
98-100% passing 325-mesh
50-lb. triple-wall paper bags

Olin Mathieson also offers a full line of conditioned, oil-treated sulphurs for the rubber industry. For complete information call your Olin Mathieson representative or write today.

MATHIESON

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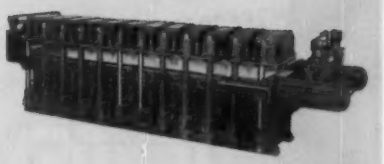
ORGANIC CHEMICALS: Ethylene Oxide • Ethylene Glycols • Polyethylene Glycols • Glycol Ether Solvents • Ethylene Dichloride • Dichloroethylether • Formaldehyde Methanol • Sodium Methylate • Hexamine • Ethylene Diamine • Polyamines • Ethanolamines • Trichlorobenzene • Polychlorobenzene • Trichlorophenol

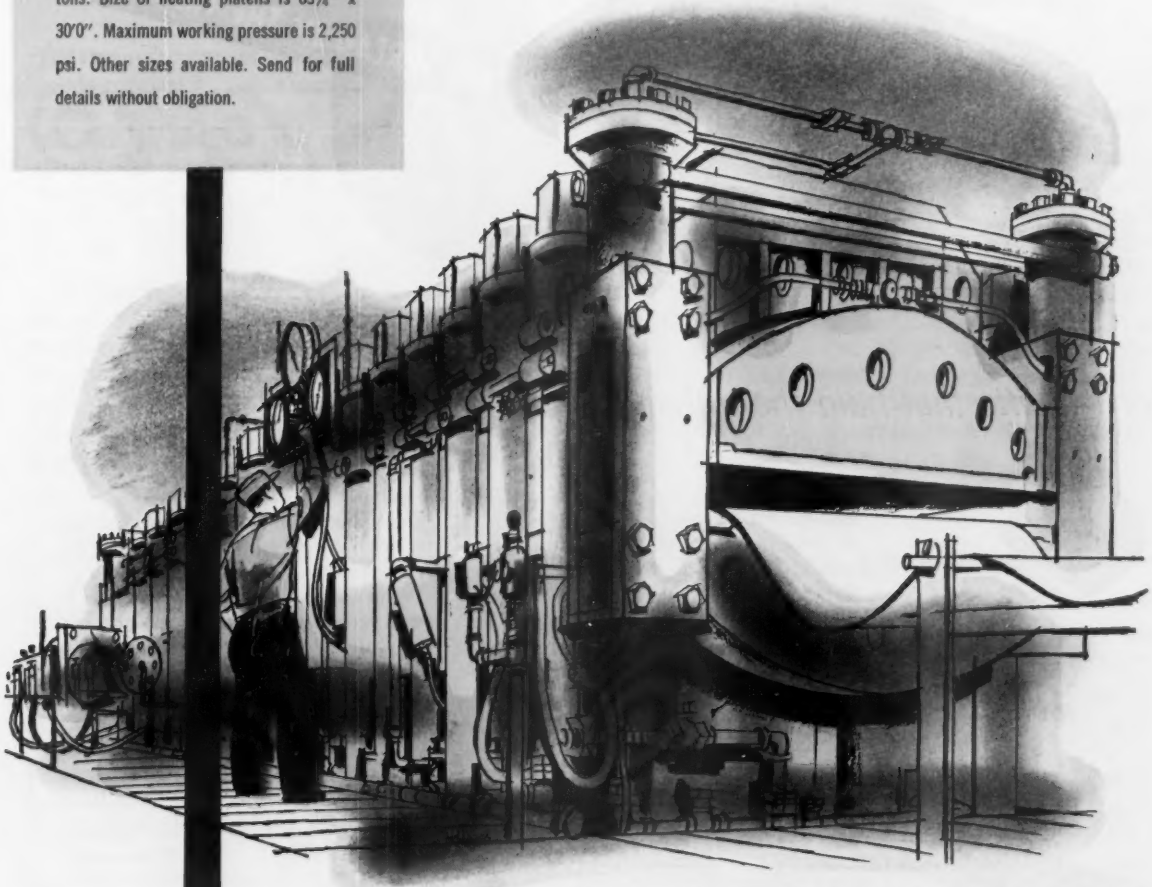
3802

The standard by which other presses are judged



Single Opening Belt Press for vulcanizing rubber belting. Press is equipped with hydraulic stretcher and clamping units mounted at the ends of the moving platen to maintain tension on belt while it is being processed. Press capacity is 3,180 tons. Size of heating platens is 63¼" x 30'0". Maximum working pressure is 2,250 psi. Other sizes available. Send for full details without obligation.

The proof of any press is its performance; excellence invariably shows up in service. How to be sure of quality when you choose a press? Simply look for the name 'R. D. Wood' on the nameplate. During more than 150 years, this name has never appeared on a press of inferior quality. In every R. D. Wood press, meticulous design, select materials, scrupulous craftsmanship combine to give you over-all efficiency, operating ease, production economy and long service. Write for engineering data on R. D. Wood presses for the rubber industry.



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MAKERS OF HYDRAULIC PRESSES AND VALVES • FIRE HYDRANTS • CAST-IRON PIPE • GATE VALVES • GAS PRODUCERS • ACCUMULATORS

For top lifts that hold their shape under heat and load...

DUREZ *thermosetting resins*

You can get outstanding advantages, both in processing and end-product benefits, with Durez phenolic resins especially designed for compounded stocks or solvent-type adhesives. The familiar top lift of GRS rubber is a typical example.

During processing, resins formulated for GRS serve as effective plasticizers. But these Durez resins have no thermoplasticity after cure and thus serve to prevent both cold flow and distortion under heat. This dimensional stability under load enables top lifts to retain their shape, adding to walking comfort and attractive appearance throughout their service life. And the service life itself is longer because of the resins' resistance to abrasion.

With GRS, Durez resins are effective in small percentages—even as little as 5 to 10 parts of resin on 100 of rubber show results. If you have not looked into the advantage of phenolic resins in GRS, Buna N and other types of synthetic and natural rubber, you may find it highly profitable to talk things over with us. As a starter, let us send you the latest edition of our bulletin on Resins for the Rubber Industry.

DUREZ®

Phenolic Resins that fit the job

HOOKER CHEMICALS & PLASTICS

DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

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Philprene®

TECHNICAL NEWS ITEM NO. 3

Replacement of GR-S 1100 with new PHILPRENE 1605 provides improved physical qualities plus superior processability.

The manufacture of mechanical goods requires a rubber with high tensile strength and good aging qualities. In addition, this rubber should also possess easy processability. Up to now, a combination of these qualities was difficult to achieve.

Before the development of PHILPRENE 1605 many compounders were forced to use GR-S 1100, a hot rubber-EPC masterbatch, to meet higher tensile strength requirements. They combined this with a hot rubber-Philblack® A masterbatch when good processability was a must. Now, both of these masterbatches can be replaced by PHILPRENE 1605, a new cold rubber-Philblack A masterbatch.

Before aging, PHILPRENE 1605 is *equal* to GR-S 1100 in tensile strength. After oven aging for 70 hours at 212 F, it is *superior* to GR-S 1100. See data tables below. PHILPRENE 1605 also possesses lower hysteresis properties. And because PHILPRENE 1605 requires less accelerator, compound costs are reduced.

Helpful Technical Service

For information on the characteristics and performance of various compounds, or for advice on processing and recipes, consult your Phillips technical representative. Phillips research facilities and years of practical experience with rubber can be of help in solving your rubber problems. Feel free to call your Phillips technical representative at any time. He will be glad to be of assistance.

	PHILPRENE 1605	GR-S 1100
Mooney ML-4-212 F	40	42
300% Modulus, psi	1600	1150
Tensile Strength, psi	2600	2680
Elongation, %	520	565
Shore Hardness	66	65
	OVEN AGED 70 HRS. AT 212 F	
Tensile Strength, psi	2500	2240
Elongation, %	280	305
Shore Hardness	74	73
Heat Build-Up, T°F	60.5	65.5
Rebound, %	53	44
Compression Set, %	15.6	19.9

Compounding Recipes

Philprene 1605	150	—
GR-S 1100	—	150
Zinc Oxide	5	5
Stearic Acid	2	2
Philrich® 5	10	10
Sulfur	1.75	1.75
Primary Accelerator	1.3	1.3
Secondary Accelerator	—	0.3

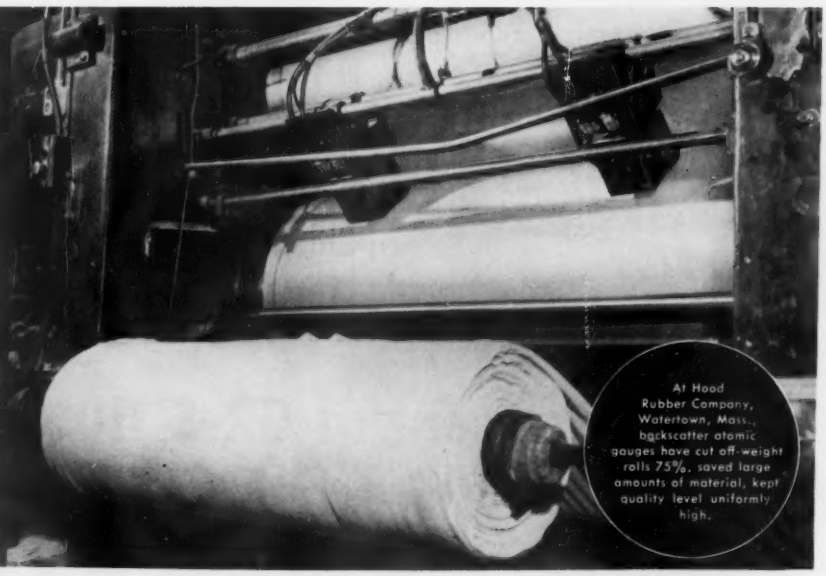
PHILLIPS CHEMICAL COMPANY

Rubber Chemicals Division

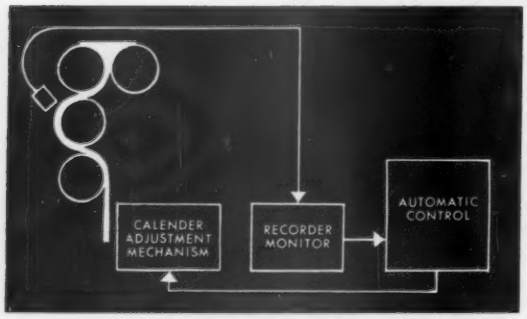
318 Water Street, Akron 8, Ohio

District Offices: Chicago, Providence and Trenton

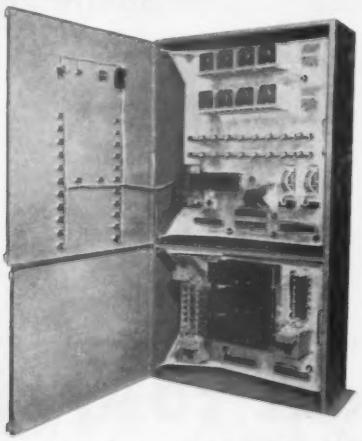
NO TWO WAYS ABOUT IT!


At Hood Rubber Company, Watertown, Mass., backscatter atomic gauges have cut off-weight rolls 75%, saved large amounts of material, kept quality level uniformly high.

Experience proves that there is a superior way to control thickness in coating, impregnating, laminating or calendering rubber sheet.



Backscatter gauges located at the calender rolls "sense" rubber thickness, report it to the automatic control system which then adjusts the rolls to the precise setting to keep material exactly "on gauge" from edge to edge of the sheet.



Tracerlab's new dual channel automatic control offers precise, automatic continuous control of thickness . . . eliminates shut-down for manual gauging . . . "closes the loop" and puts automation to work for you.

Only Tracerlab's Beta Gauges using back scatter radiation offer all these advantages for cutting costs and improving quality!

INSTANTANEOUS DETECTION of thickness variation. Gauges can be located close to nip and can "read" changes immediately, minimizing "off spec" production.

MANUAL OR COMPLETELY AUTOMATIC OPERATION. Adding Tracerlab's automatic control console "closes the loop" and makes your operation completely automatic.

CUSTOM INSTALLATION to fit your particular needs from standardized components offers economy.

RUGGED INDUSTRIAL CONSTRUCTION enables this gauge to withstand rough conditions. Easily accessible and standardized parts make it easy to service.

FASTER START-UP TIME. Some users report change-over from one job to the next has been reduced to one-third of time previously taken.

EASY TO OPERATE. The equipment can be used by production line employees.

Tracerlab originated and perfected the back scatter principle for its Beta Gauges over seven years ago. These gauges were developed by our engineers to meet the need for a gauge where source and detector are one unit making it ideal for use where mounting space is limited or for coating applications where the thickness of a coating as it passes over a calender is to be determined.

If your plant is not getting the benefits of this modern control system, write today for further information.

BE SURE TO SEE TRACERLAB'S BETA GAUGES AND AUTOMATIC CONTROL DEVICES AT BOOTH #1140, NATIONAL PLASTICS EXPOSITION.

Get this informative data book on how Tracerlab Beta Gauges with automatic control can make savings for you.

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NEW HELP FOR CRACKING CONTROL

CHICAGO . . . UOP ANNOUNCES NEW HIGH-POTENCY ANTIOZIDANT UOP 288. NEW PLANT ASSURES FULL AVAILABILITY AND HIGHEST QUALITY OF THIS NEW PRODUCT AND ALSO FAMOUS UOP 88 TO PROVIDE RUBBER PRODUCTS COMPLETE PROTECTION FROM OZONE CRACKING.

UOP

88® and 288

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RUBBER ANTIOZIDANTS

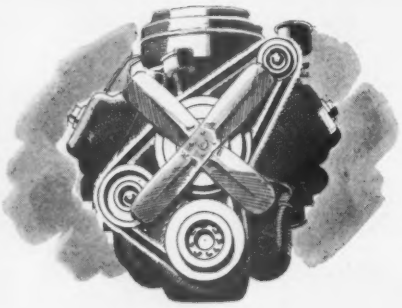
Universal's modern new plant at McCook, Illinois, is now producing a new antiozidant UOP 288 as well as the already widely-used UOP 88. Whatever your product, from tires to hot water bottles, if it uses rubber, natural or synthetic, ask us to recommend the UOP formulation that will give it complete protection from ozone attack.

PRODUCTS DEPARTMENT

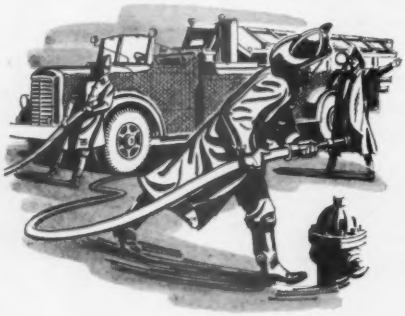
UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U. S. A.

FORTISAN* 36 RAYON FIBER
makes these products STRONGER



V-BELTS. These vital power transmitters gain extra life when reinforced with Celanese FORTISAN-36. After extra long wear stretch is negligible. It won't expand or contract under normal V-Belt operating conditions so as to affect the belt's efficiency. This is because it's dimensionally stable. FORTISAN-36 is far stronger than conventional fibers, imparts higher tensile strength. That's why V-belts with FORTISAN-36 are now being used as original equipment on automatic washers, power mowers, trucks, passenger cars and farm tractors.



HIGH-PRESSURE FIRE HOSE. Used as filler cord in interior and exterior jackets of high-pressure fire hose, FORTISAN-36 pays off in a lighter but stronger hose that's more flexible, easier to handle and rack, and more heat-resistant. Also, it saves space because it folds tighter. FORTISAN-36 saves money in processing since it need not be heat-stretched.

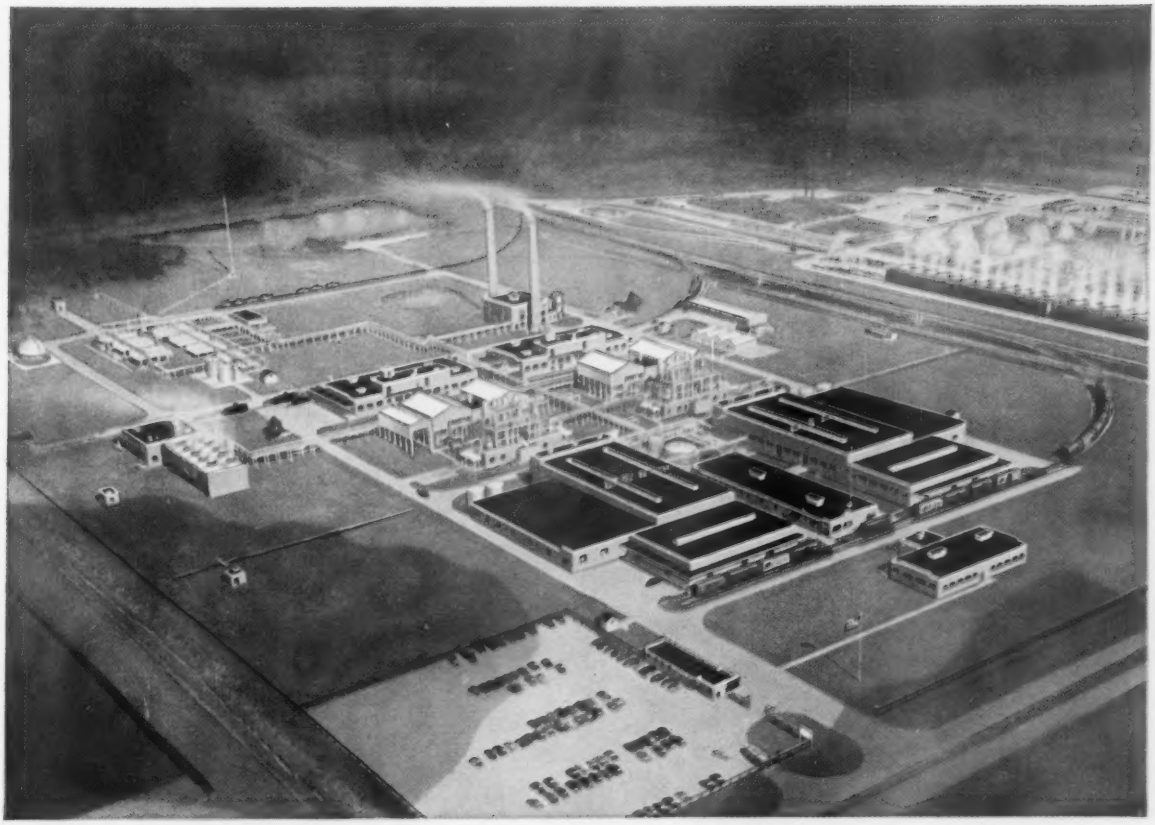
HIGH-PRESSURE HOSE. High tensile strength, remarkable stretch-resistance and nearly perfect dimensional stability make FORTISAN-36 first choice for many types of high pressure hose. It produces a hose that's lighter, safer, more flexible and capable of taking extreme pressures easily. Hose of FORTISAN-36 appear likely to do a better job in aircraft controls, hydraulic presses, power feeds, trucks, greasing tools, road-building equipment.

FORTISAN-36 IS GOING PLACES! Besides these applications, this new Celanese high-tenacity, heavy-duty rayon of saponified acetate has practical application for truck tires, plastic laminates, filters, paper reinforcement, tarpaulins and webbing. Let us show you how it can improve your product. Write for booklet TD20A to Celanese Corporation of America, Industrial Sales Dept., Textile Division, Charlotte, N. C. Branch offices: 180 Madison Ave., N. Y. 16; Pilgrim Sq. Building, 9 Overwood Rd. at W. Market St., Akron 13, Ohio (Tel.: TE 6-2392). *Reg. U.S. Pat. Off.

Celanese

FIBERS FOR INDUSTRY

FORTISAN* RAYON · FORTISAN*-36 RAYON · ARNEL* TRIACETATE · ACETATE · VISCOSE-RAYON

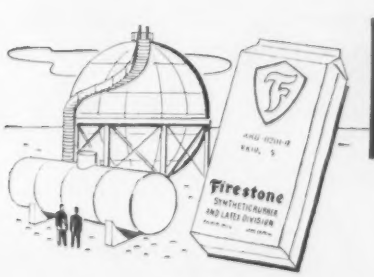


Firestone, world's largest rubber producer, expands its synthetic rubber program

Today rubber consumption is at an all-time high and Firestone is straining every facility to make more high quality rubber and latex to meet the tremendous demand. The synthetic rubber plants, at Lake Charles and Akron, are working 'round the clock and Firestone is planning ahead . . . a multi-million dollar expansion program will soon increase the production capacity of Firestone synthetic by nearly 50%.

Synthetic rubber is not new to Firestone . . . even before Pearl Harbor, while the entire rubber industry was frantically working on a substitute for natural rubber, Firestone scientists had actually produced the same synthetic rubber which eventually became GRS. Then in April 1942, Firestone began operation of the first government synthetic plant. Since that time, these same research scientists have been constantly striving to make a better rubber. The latest achievement of Firestone scientists is a chemical duplication of natural rubber, the life-long goal of research chemists.

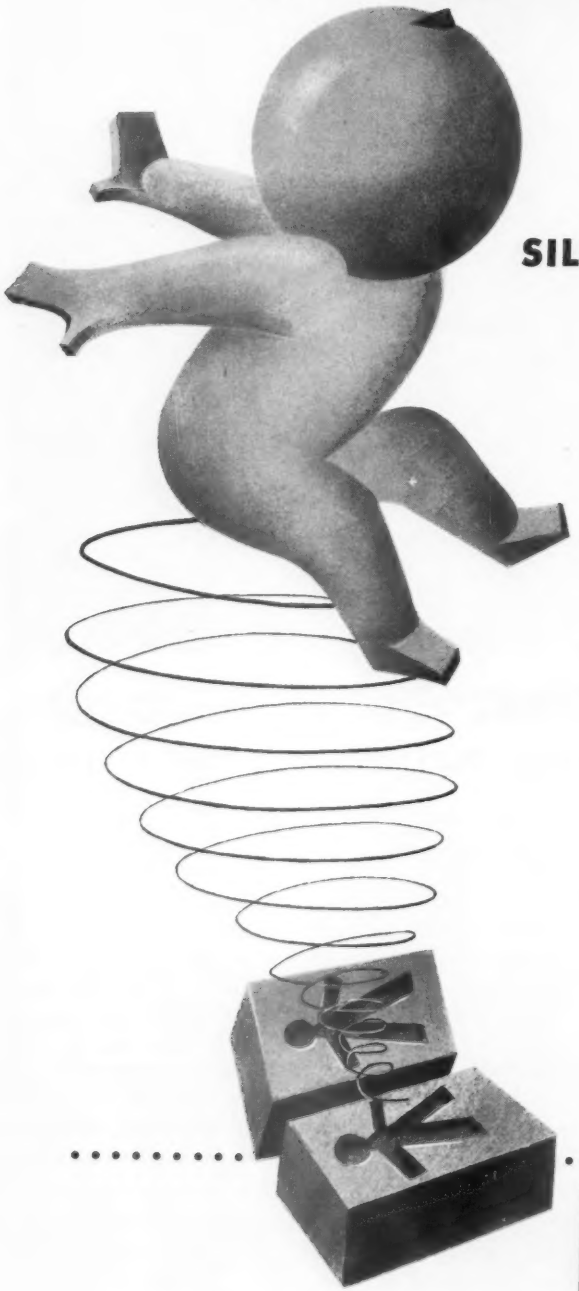
Look to Firestone for all your rubber needs. With over 30 years' experience gained from the operation of its vast Liberian Plantation and its aggressive research in synthetic rubber, Firestone is better equipped to meet your problems. A Firestone Technical Representative will be glad to work with you. Phone or write Firestone, Synthetic Rubber and Latex Division, Akron, Ohio.



Firestone

BEST IN RUBBER

PARTS POP FROM MOLDS



when you use G.E.'s new, improved **SILICONE MOLD LUBRICANT, SM-62**

General Electric's new silicone mold lubricant, SM-62, offers molders of tires, mechanical rubber goods and plastics quick, easy release—even on the toughest jobs. Parts "come clean"—with better surface finish, sharp detail, close tolerances.

Here are some of the special benefits which SM-62 offers you:

1. **Better surface finish**
2. **Better mold coverage**
3. **Improved stability under mechanical agitation**
4. **Improved stability at high temperatures**

Economical, SM-62 saves you time and money. Non-carbonizing, it reduces mold cleaning costs and down time—minimizes rejects! Only small quantities are required.

NEW APPLICATION FACTS

General Electric has prepared complete, new packages of application data on *silicone mold lubricants* and *antifoam* agents for the rubber and plastics industries. For a free copy of this latest information, just fill in and mail the coupon below.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SILICONE PRODUCTS DEPARTMENT **Section 67-1A**
GENERAL ELECTRIC COMPANY **WATERFORD, NEW YORK**

Please send me a free copy of your application data on the following:

( ) Rubber mold lubricants ( ) Antifoam agents
( ) Plastics mold lubricants ( ) Include free sample of SM-62 mold lubricant

Name _____ Position _____

Firm _____

Street _____

City _____ Zone _____ State _____

IN CANADA, MAIL TO CANADIAN GENERAL ELECTRIC CO., LTD., TORONTO

HERE'S WHY

You Can Depend On National Rolls For Durable Performance

METALLURGICAL SKILL

In making rolls at National, quality is paramount. National's metallurgical staff maintains constant watch over all metallurgical and physical properties.

LABORATORY CONTROL

An up-to-date physical and chemical laboratory guides quality control at National . . . from analysis of new materials to testing of metallurgical specimens . . . and the laboratory carries on continuous research into new and better materials, which is reflected in National's strong, durable rolls.

EXPERIENCE

The intricate problems of casting superior rolls can only be mastered through experience. For almost a half-century, we have been supplying iron and steel rolls to many industries.

PRECISION

In National's modern roll shop, the newest in machine tool equipment is used to finish roll surfaces. This equipment plus our machinists' skill is your assurance of rolls finished to the closest tolerance.

When you are in the market for replacement rolls, call on us for our recommendations. We may be able to help you choose rolls that will give you longer service life.

NATIONAL ROLLS

THE NATIONAL ROLL & FOUNDRY CO.

A Wholly-owned Subsidiary of General Steel Castings Corporation

AVONMORE (Westmoreland County) PENNSYLVANIA

Specialists in Iron, Alloy Iron and Steel Rolls, Carbon, Alloy and Manganese Steel Castings

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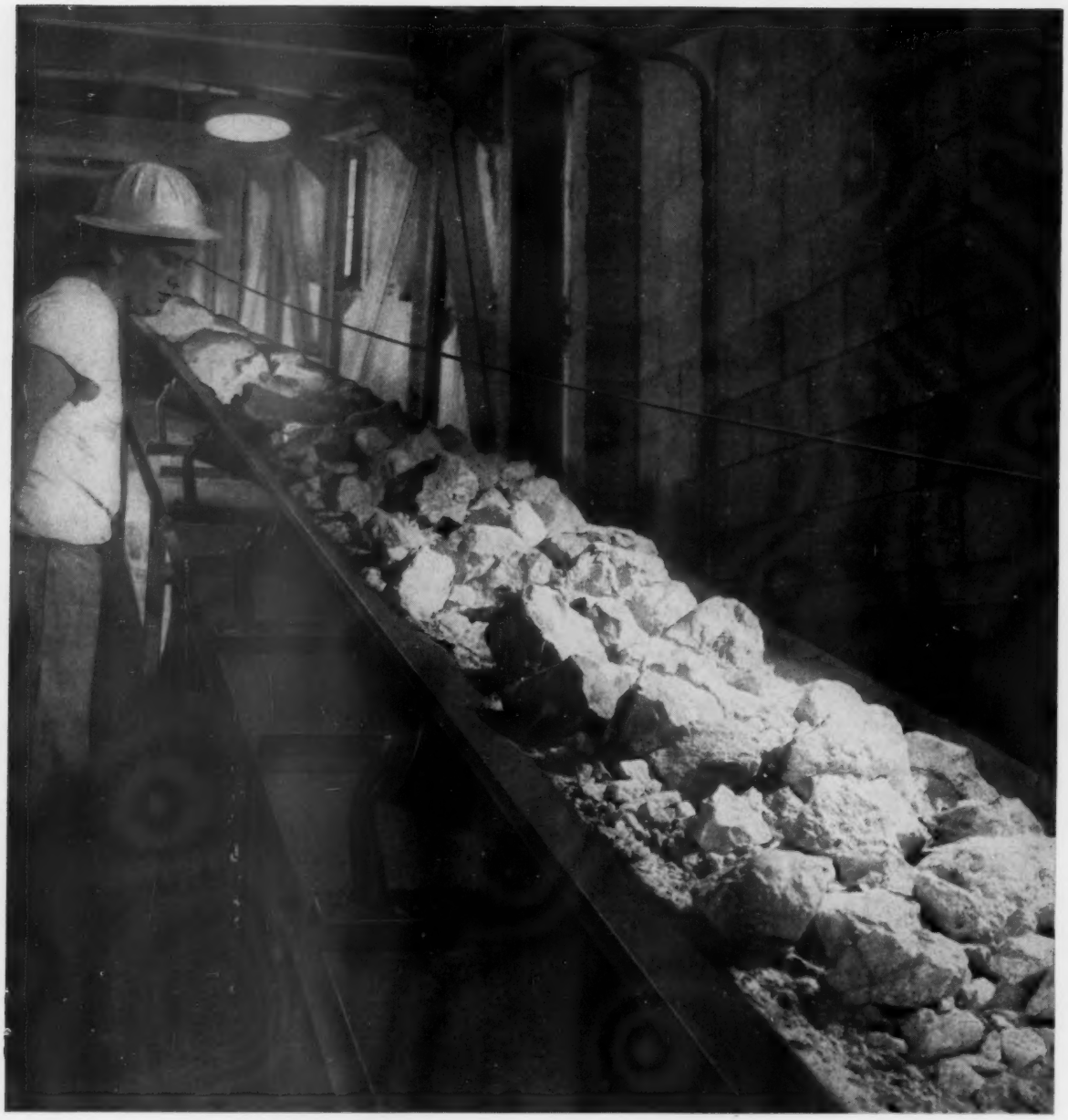

THE FABRIC THAT MOVES MOUNTAINS – National Gypsum Company's new gypsum mine at Shoals, Indiana, needed a really tough conveyor system employing a belt nearly a mile long – one that could move loads up to 350 tons per hour up a shaft 500 feet beneath the surface of the earth at an incline of better than 17 degrees. Hewitt-Robins, Inc., supplied this belt – with a carcass especially constructed from rayon and nylon by Mt. Vernon-Woodberry Mills. The new belt, called a Super Raynile Conveyor Belt, is lighter than comparably strong cotton duck and rubber. It is more resilient and equal in strength to steel reinforced belting. Testing in use has shown it to be one of the strongest ever built.

This is another example of how fabrics made by Mt. Vernon-Woodberry Mills, and the industries they serve, are serving America. Mt. Vernon-Woodberry Mills engineers and its laboratory facilities are available to help you in the development of any new industrial fabric or in the application of those already available.

UNIFORMITY Makes The Big Difference In Industrial Fabrics

Mount Vernon Mills, Inc.

A LEADER IN INDUSTRIAL TEXTILES

TURNER HALSEY COMPANY *Selling Agents*

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New Tire Designs for '56 and '57?
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THE ANSWER'S STILL
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Whatever the passenger tire, with or without tubes, with 16", 15", 14" or 13" diameter rims, large or small, fat or thin, it will give the increased wear needed for today's and tomorrow's modern high speed cars, if it's made with a Cabot Vulcan black. On-the-road and off-the-road truck tires give best performance too, when they're made with Cabot carbon blacks.
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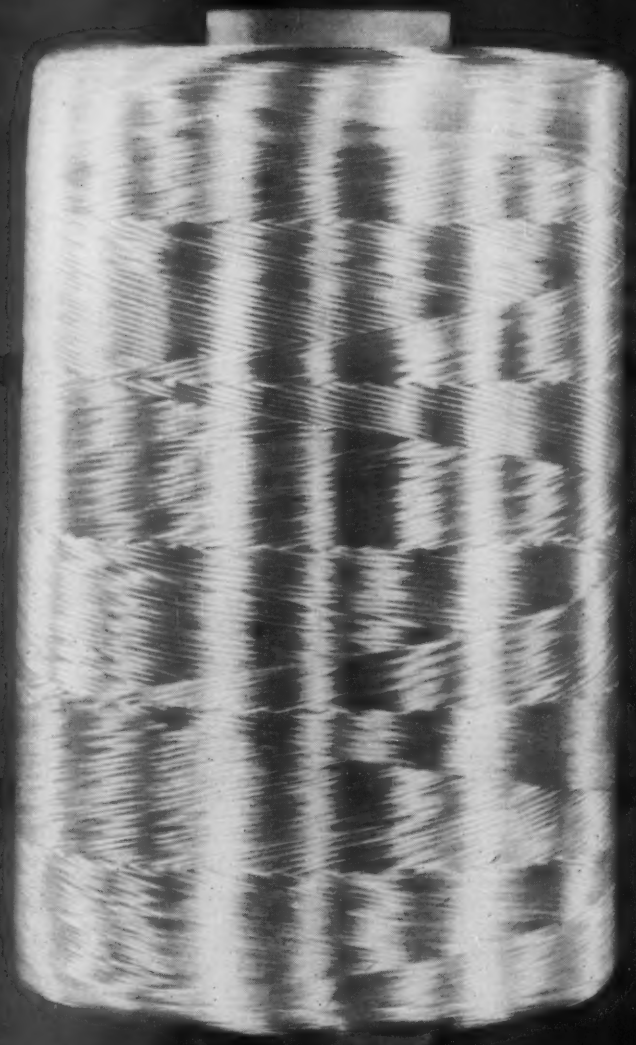
NOW, brought to you



*caprolan**

NYLON HEAVY YARNS

Allied Chemical's new Caprolan heavy yarns are of particular interest to makers of:

Heavy Duck • Industrial Slings • Fire Hose • Cords & Braids
Upholstery Fabrics • Webbings • Conveyor Belt Fabrics
Rope & Twine • Tapes & Belts • Carpets & Rugs

* TRADE-MARK

exclusively by Allied Chemical...Caprolan®!

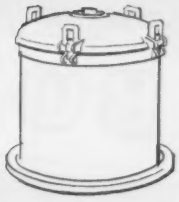
Nylon Heavy Yarns

A Completely New Class of Durable Textile Yarns Available in 2,100, 2,500, 5,000 and 15,000 Denier

Mills report these advantages:

1. Cuts Plying Costs! Supplied in the total deniers you need, Caprolan nylon heavy yarns are engineered to your specifications without plies. No need to inventory costly finer deniers. Heavy yarns with nominal twist are supplied on knotless 10-pound parallel nonreturnable tubes.

2. Cuts Heat-Setting Cycles! Another money-saving advantage of these heavy yarns is that heat-setting cycles can be materially shortened because of Caprolan's workability with heat.



3. Minimizes Dyeing Problems! Heavy nylon constructions are much easier to dye when Caprolan heavy yarns are used. Allied's new fiber has a remarkable affinity for all classes of dyestuffs.

Other Heavy Yarns Can Be Engineered to Your Specifications In a Range from 2,000 to 50,000 Denier!

Now, from Allied Chemical—an important new tool for the textile industry—nylon heavy yarns engineered to your specifications! This completely new class of durable textile yarns eliminates need to ply multiple ends of finer deniers to achieve a higher total effect.

Caprolan heavy yarns are versatile, too. Whether you make duck, webbings, carpet, upholstery or any other type of heavy nylon fabric these heavy yarns will find a place in your mill. They are especially effective where toughness and high impact strength are important considerations.

These nylon heavy yarns are made exclusively by Allied Chemical. In addition to all of the known qualities of nylon, Caprolan heavy yarns offer such plus values as affinity for all classes of dyestuffs, *deep* dyeing and uniform level shades.

These new heavy yarns already are in commercial use in important mills and evaluation programs are under way in many others. If you would like more information, technical assistance, or would like to evaluate Caprolan heavy yarns in your own mill, write:

Fiber Sales and Service

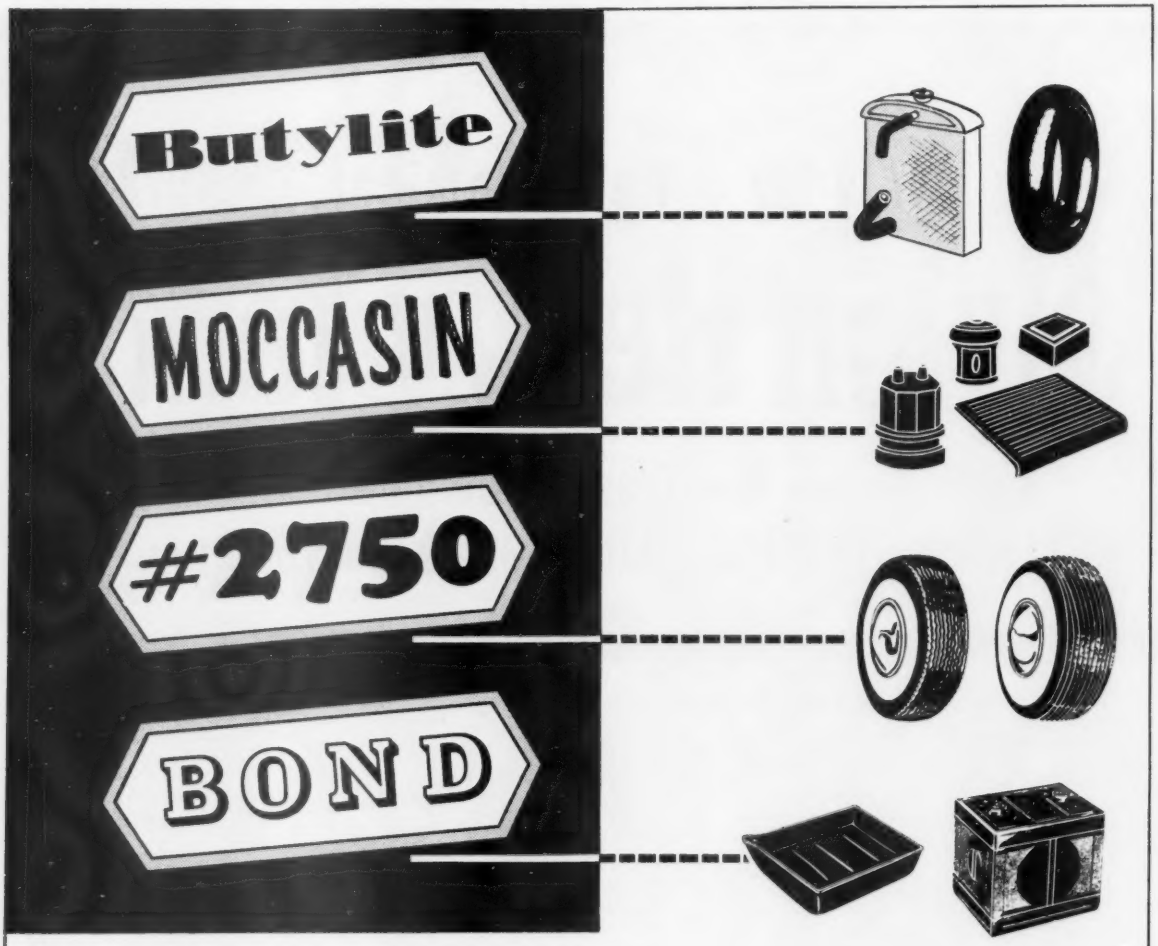
NATIONAL ANILINE DIVISION

Allied Chemical & Dye Corporation

261 Madison Ave., New York 16, N. Y.

Branch Offices—Jefferson Standard Building, Greensboro, N.C., 200-204 S. Front St., Philadelphia 6, Pa., 15 Westminster St., Providence 3, R.I.

SERVING THE TEXTILE INDUSTRY SINCE 1879



THERE'S A PEQUANOC RECLAIM for your rubber formula

These four standards are only a few of the many well-known rubber reclaims available to you at Pequanoc for specific applications.

In their fifty years of specialization, Pequanoc technicians have developed top quality reclaims recognized and accepted by the rubber industry as standard. To keep this product leadership, Pequanoc maintains a modern laboratory for constant supervision of quality and performance.

To manufacturers looking for economies in their product, we say — **"There is a Pequanoc reclaim for your rubber formula."** On your particular problem, consult with Pequanoc — you are always assured personal and prompt attention.

Pequanoc Rubber Co.

MANUFACTURERS OF RECLAIMED RUBBER **MAIN SALES OFFICE and FACTORY: BUTLER, N. J.**

YOUR CONFIDENCE has made possible

big progress in pigments

CALCENE®

HI-SIL®

SILENE®

In recent months, we have been discussing the history and development of reinforcing pigment materials—Calcene, Silene and Hi-Sil. All three have essentially followed a similar pattern much as other chemicals and industrial products—from idea through research examination, production development stages, testing, and finally commercial output.

Intriguing as the last decade has been in pigment development, the story has only begun. Unquestionably, the ability to adapt changes in technology to times and conditions will be more a part of the future than the past.

Whatever success has been achieved is not due to any single factor except possibly enthusiasm. Within the Columbia-Southern organization it has been a cooperative venture shared equally by research, development, production, sales and management units.

Still, such enthusiasm means little without the inestimable help and confidence of our many friends in the industry who have made such great contributions to our performance. The willingness to expend time, effort and money verifying the results of our labors in laboratory and production has been most gratifying. Our pledge here at Columbia-Southern is to maintain and enhance this respect through earnest, honest service.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
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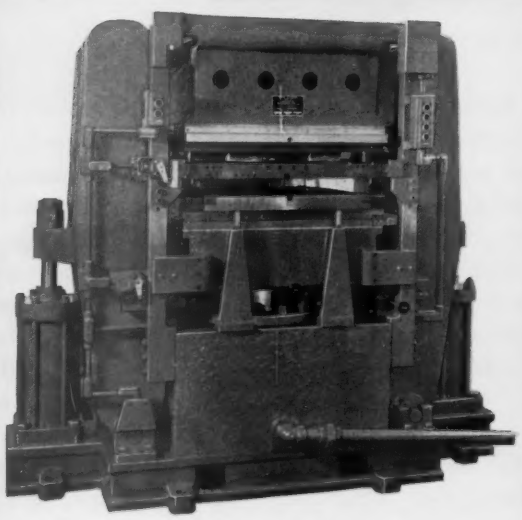
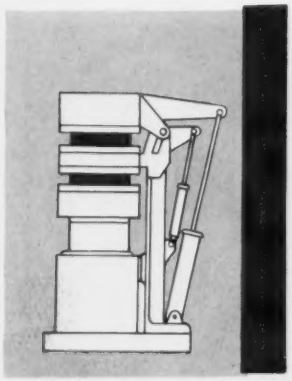
CHEMICAL PROGRESS WEEK—APRIL 23-28

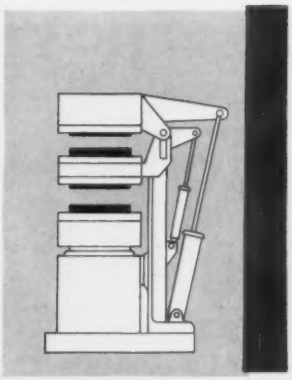
NOW



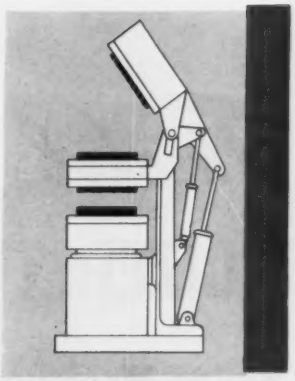
Above photo is a two deck or two opening press. However, the intermediate platen is a transfer mold and the plunger plate replaces the usual mold fastened to tilting head.



1. Completion of cure. Press is ready to open.

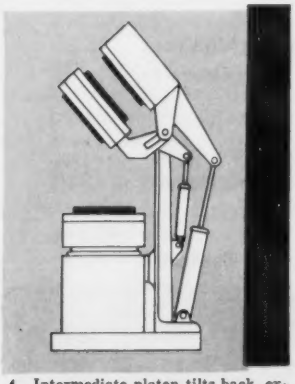


2. Press opens. Molds remain parallel during entire stroke of ram. This is necessary for deep cavity molds.

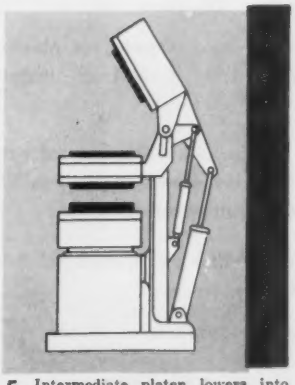


3. Head tilts back, exposing two halves of mold in top deck—cured articles are removed.

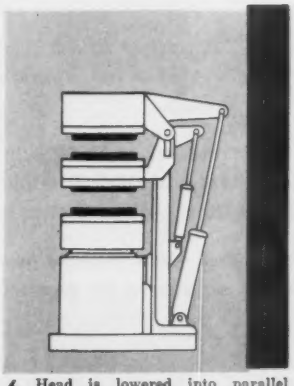
A TWO-OPENING TILTING HEAD PRESS



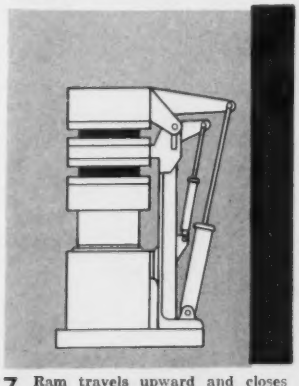
4. Intermediate platen tilts back, exposing two halves of mold in lower deck. Cured articles are removed. Fresh unvulcanized stock is placed in mold cavities.



5. Intermediate platen lowers into parallel position — unvulcanized stock is inserted in mold cavities.



6. Head is lowered into parallel position.



7. Ram travels upward and closes press. DIRECT AND FULL PRESSURE OF HYDRAULIC SYSTEM IS AVAILABLE THROUGHOUT ENTIRE STROKE OF RAM.

- Only the material moves in and out of the press. Molds remain in press, therefore mold halves **stay in register.**
- Cures two sets of molds at the same time.
- Timer, at prescribed intervals, automatically raises and lowers the ram, tilt head and intermediate platen.
- One operator, male or female, can attend to approximately as many presses as there are minutes in cure time. The operator simply removes cured articles and replaces with uncured, pre-formed stock.
- Press Sizes: 24-32-36"—up to 1,000-ton pressure.
- Two Opening Press can be used as a single opening press for extremely deep molds.

OF THE TILTING HEAD

Sales and Engineering by

HALE and KULLGREN, INC.

P. O. Box 1231 · AKRON, OHIO

MANUFACTURED BY

THE AETNA-STANDARD ENGINEERING CO., PITTSBURGH, PA.

PLANTS IN WARREN, OHIO · ELLWOOD CITY, PA.

Thiokol®

PLASTICIZER TP-90B

Yields Maximum Low Temperature Flexibility and Maintains Excellent Physical Properties

TP-90B

"Thiokol" Plasticizer TP-90 B is an efficient low temperature plasticizer. Even at high concentrations it does not appreciably impair the physical properties of the compounds in which it is used.

"Thiokol" Plasticizer TP-90 B is highly compatible with natural rubber, Neoprene nitrile-type rubbers and GR-S. It imparts excellent low temperature flexibility to these elastomers and maintains high resilience over a wide temperature range.

The following results illustrate how "Thiokol" TP-90 B yields excellent low temperature flexibilities while still maintaining the physical properties:

	Natural Rubber	Neoprene GN	Hycar OR-15	Paracril-B	GR-S
TP-90B, p. h. r.	30	20	30	30	30
Cure, min. /° F.	30/310	45/300	30/310	30/310	30/310
Tensile, p. s. i.	2200	2600	2380	2250	1500
Elongation, %	530	410	300	350	380
Shore Durometer	42	68	70	61	45
Low Temperature Flexibility**	**–95°F**	**–70°F**	**–70°F**	**–80°F**	**–95°F**

**Determined according to a modification of ASTM method D 1043-49T. The temperatures shown are the values at which the absolute torsional moduli are 10,000 p. s. i. Although the specimens were still quite flexible, G10,000 was arbitrarily chosen as the stiffening point.

For technical information and samples, write:

This information is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data, or the use of this product.

Thiokol Chemical Corporation

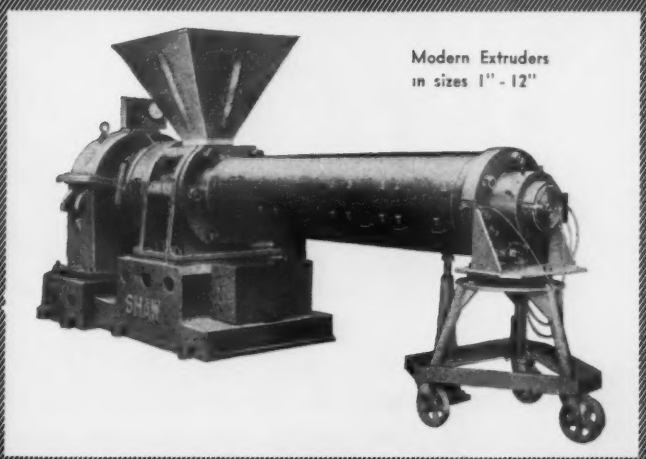
784 NORTH CLINTON AVENUE • TRENTON 7, NEW JERSEY

In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario

quality extrusions through controlled temperature zones

To produce quality extrusions without the risk of imperfection requires temperature control to a fine degree. These Shaw Extruders provide it exactly. There is all electric heating in separate zones and each zone is independently controlled by proportioning instruments.

Various screw and die designs are available for the production of piping, sheeting, miscellaneous sections, and the insulation and sheathing of cables, etc. Great attention has been paid to bearings and barrel support to avoid wear and vibration.



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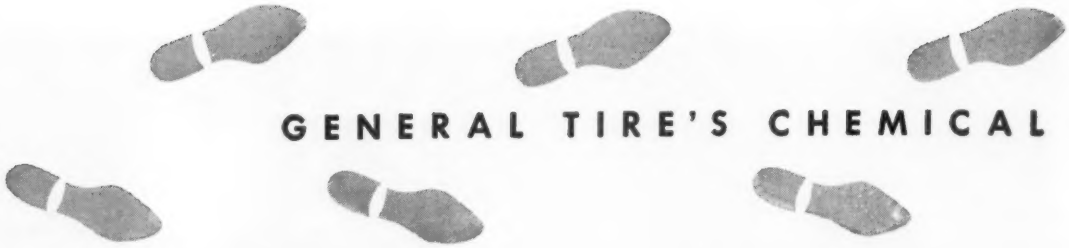

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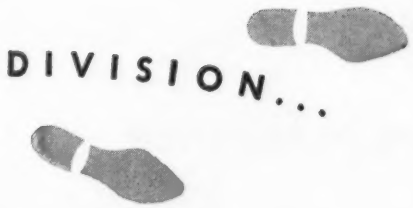

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Copies of all the papers presented at the Conference held in London on June 22-25, 1954, under the auspices of the Institution of the Rubber Industry, are presented in this volume, together with the discussions on each paper. The papers are world-wide in character and represent the latest thinking in the science and general technology of rubber. This informative volume is a **must** for all who wish to keep abreast of developments in the field.

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Stability of Ammoniated Latex and Soap-Stabilized Emulsions in the Presence of Complex Zinc Salts. *T. S. McRoberts.*

Variability of Hevea Latex. *W. L. Resing.*

Zinc Oxide Testing of Latex. *E. W. Madge, H. M. Collier,* and *J. L. M. Newnham.*

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Contribution to the Study of Mineral Elements in Field Latex. *E. R. Beaufils.*

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Production and Evaluation of Synthetic Rubber

Cation and Anion Influence in the Alfin Reagent for the Polymerization of Butadiene. *A. A. Morton, I. Nelidow* and *E. Schoenberg.*

Evaluation of Synthetic Rubbers and Latices. *I. D. Patterson.*

Recent Studies on the Structure of Synthetic Rubber. *R. F. Dunbrook, B. L. Johnson, J. L. Binder, J. M. Willis,* and *E. L. Carr.*

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Graft Polymers Derived from Natural Rubber. *G. F. Bloomfield, F. M. Merrett, F. J. Popham,* and *P. McL. Swift.*

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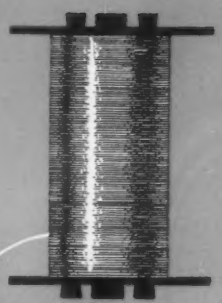

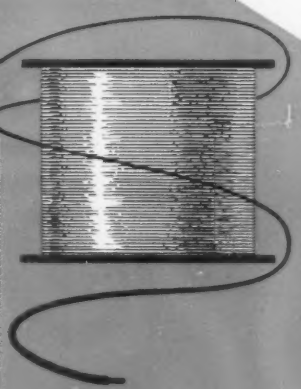

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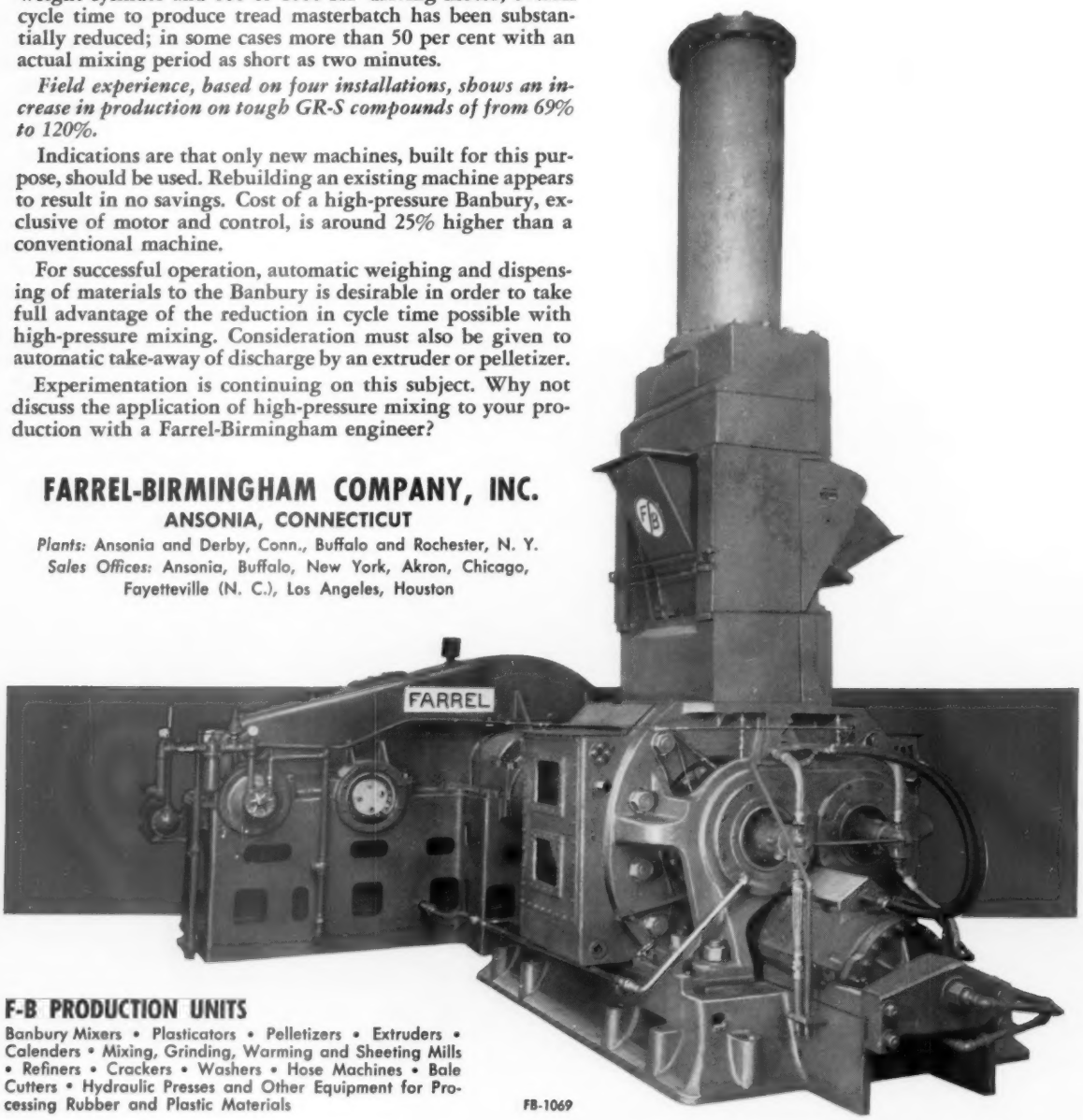

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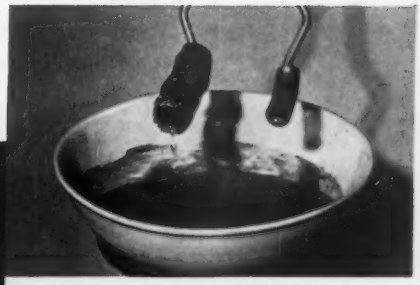

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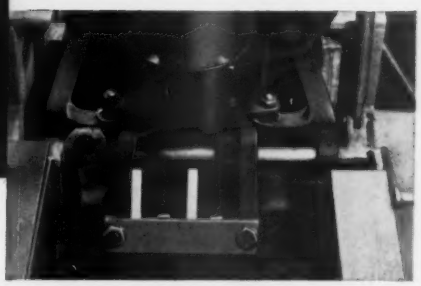

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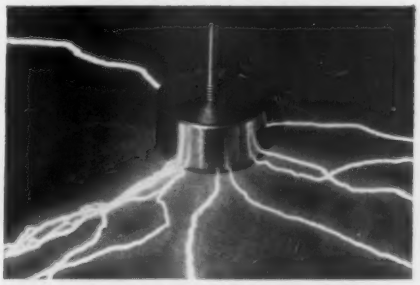

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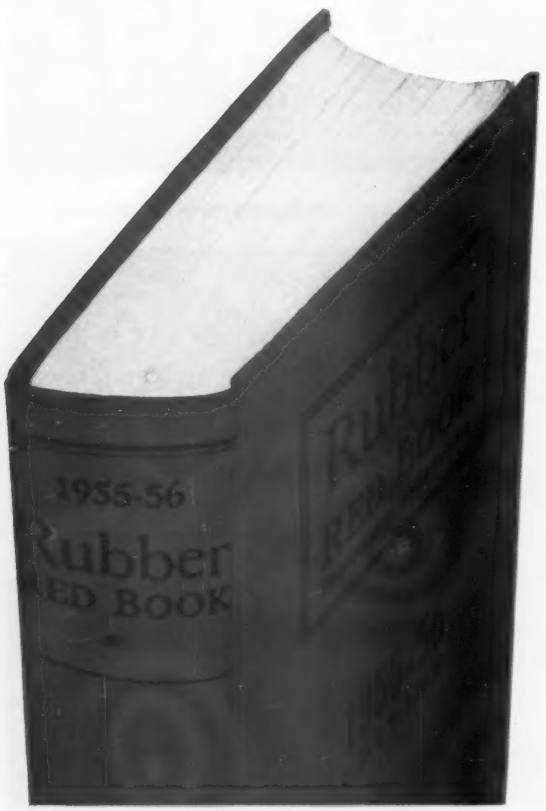

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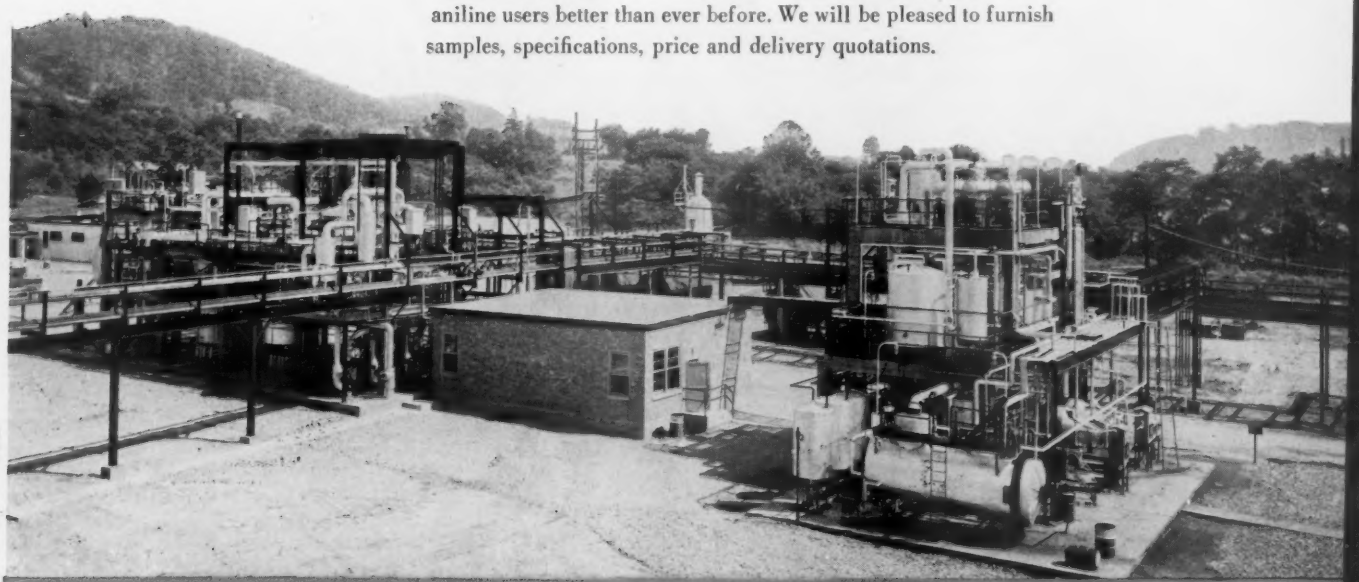

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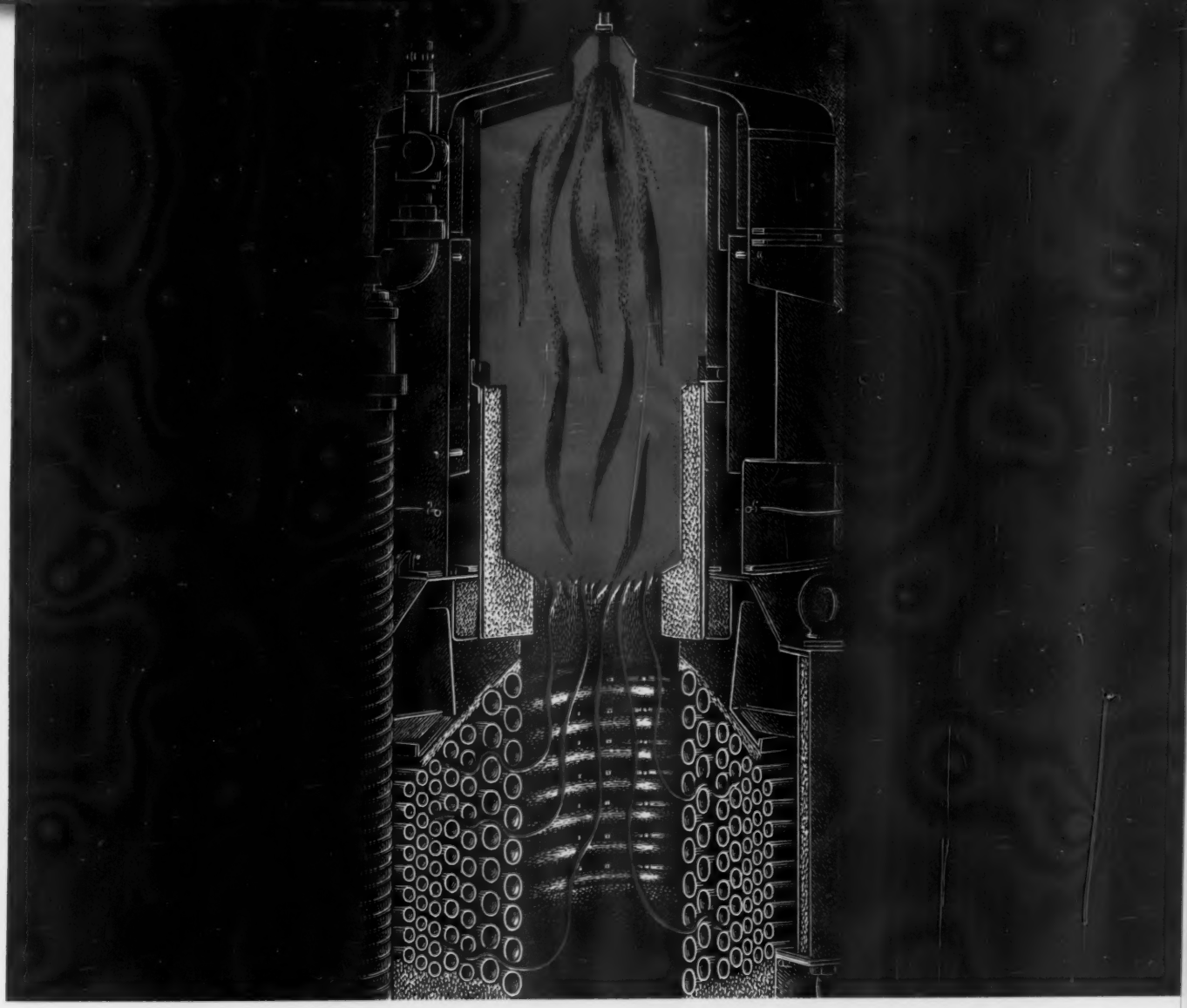

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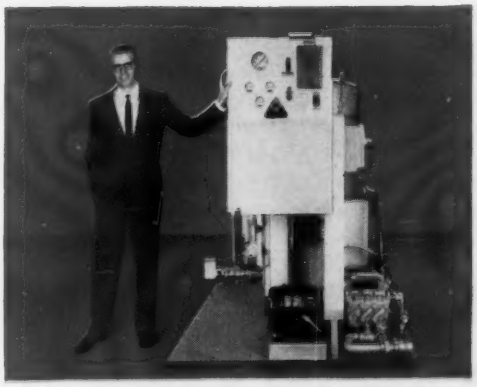

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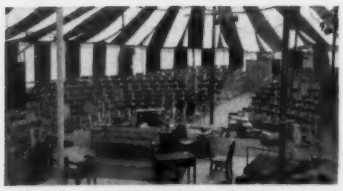

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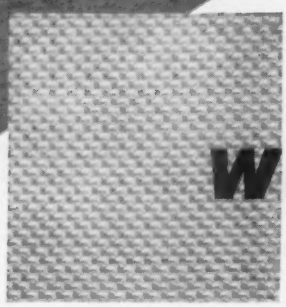

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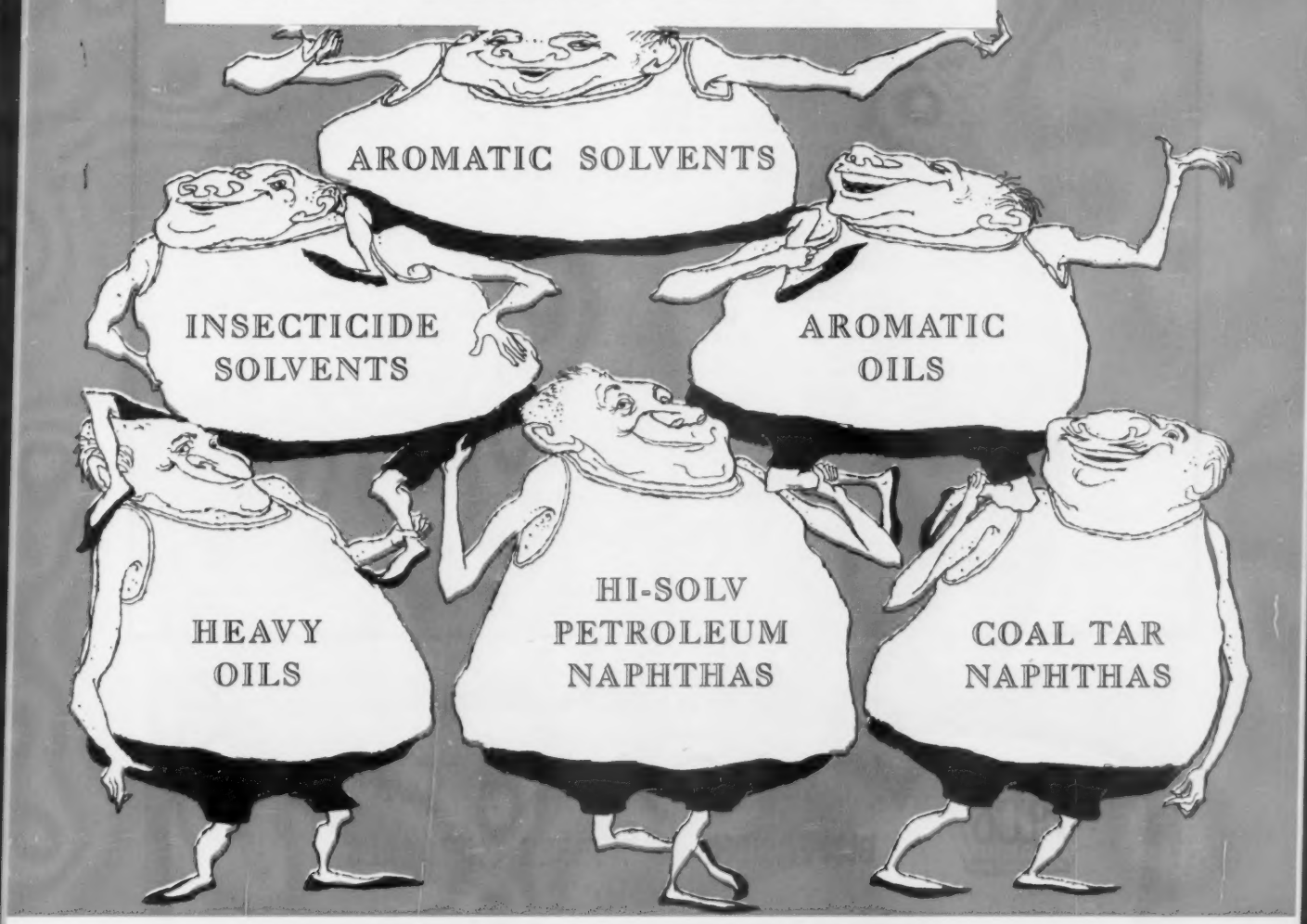

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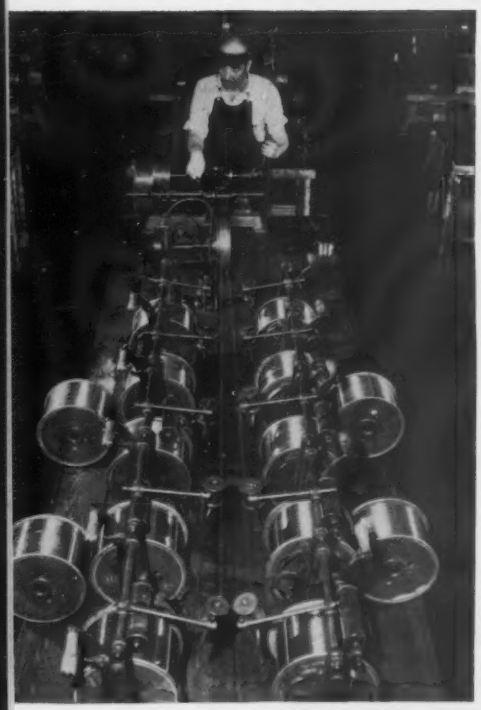
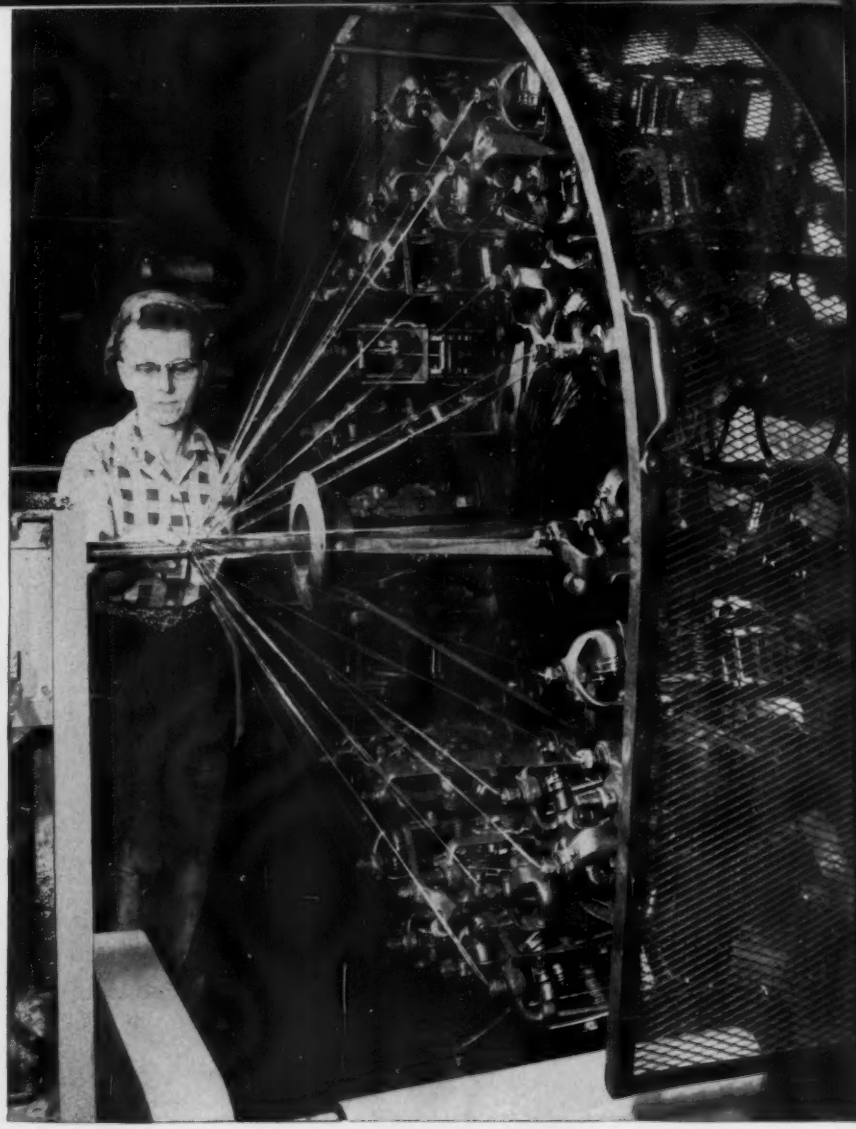


1. Fine Steel Wire furnished on 65 lb. spools, is rewound into multiple wire strands. It is extra straight for smooth spooling.

2. The Number of Wires in a multiple is determined by the design of the hose it is to reinforce. These wires have tensile strengths of up to 400,000 psi.



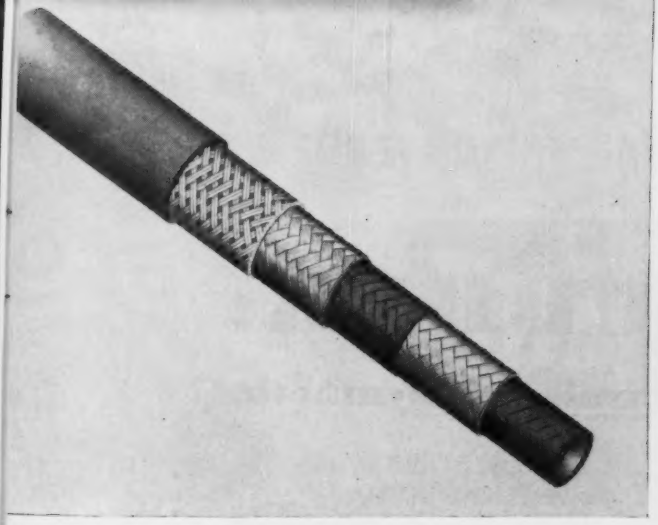
3. Multiple Strands are braided around the tube or core of the hose under constant tension in this planetary braider. Wires are uniformly sound to avoid breakage. Bright golden liquor finish on the wires makes the bonding cement applied later adhere to them.

How Fine Steel Threads Give Strength To Rubber Hose

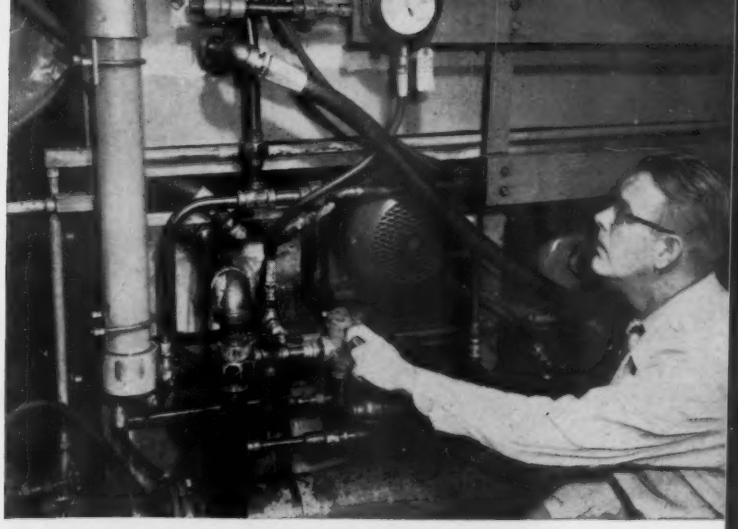
Concealed inside a rubber covered flexible hydraulic hose is the story of how special quality steel threads, woven into intricate sinews, help control and resist tremendous internal pressures.

Such hydraulic hose is used to transmit power on an ever-widening variety of machinery and equipment ranging from hydraulic presses, power feeds on machine tools, die sinking and forming presses, multiple die-casting equipment—to aircraft controls, farm and road building equipment, trucks—even the high-pressure greasing equipment in your neighborhood gas station.

B. F. Goodrich Company, for example, produces hundreds of miles of this hose every year in a variety of more than 150 types, and in a range of diameters and constructions that will carry working pressure up to 9,000 pounds per square inch.



4. Rubber-Covered hydraulic hose has an intricate inside construction. Braiding wire is sheathed in alternate layers of textile braid and rubber to prevent friction and maintain flexibility. When man-made rubber cement is added, it fills all the interstices, bonding and sealing the hose to contain tremendous pressures.



5. Uses of Hydraulic Hose are ever-increasing as they are a vital element in development of advanced machinery and automatic controls.

The ability of hydraulic hose to contain these enormous pressures comes from braids of fine steel wire woven into its construction. It is a special wire with tensile strengths ranging from 240,000 to 400,000 pounds per square inch such as that produced by Johnson Steel & Wire Company.

• **How It Is Made**—Watching low pressure (2,500 psi) hose produced at B. F. Goodrich, for example, you see Johnson wire arriving on spools. These spools are placed on rewinding machines (photo No. 1). The wires are rewound onto a spindle in flat strands that are several wires wide (photo No. 2), depending upon the design of the hose they are to reinforce.

Spools holding the strands are placed on planetary braiding machines (photo No. 3) that can hold from 16 to 64 spools. The number used depends upon the diameter and capacity of the hose.

As the braider revolves, the strands under constant controlled tension feed onto the basic fabric of the hose which moves through the center of the machine. Each hose is constructed of wire strands and textile braids insulated by rubber to cushion, bond, and support the wire braid—serves as an anti-friction agent and gives supple flexibility (photo No. 4).

Man-made rubber cement is added to bond and seal the construction, filling all the interstices between braids. Finally a rubber coating is applied to protect the steel and cotton fabric. It is tested at twice the recommended working pressure.

• **Strong Sinews**—Obviously the wire made by Johnson Steel & Wire for reinforcing hose is something out of the ordinary. It is drawn from selected high carbon steel in diameters ranging from .008″ to .016″ and has exceptional dimensional accuracy—a tolerance of plus or minus .0005″.

It is supplied with a special golden liquor finish which provides an adhering surface for the bonding cement. This wire is very straight to make possible even spooling and has uniform tensile strength to prevent it breaking under the working tension.

This wire helps assure smooth, economical operation of the precision process of reinforcing hose which is why such producers as B. F. Goodrich and other leaders know Johnson as a dependable source of supply for hose reinforcing wire and other special wires used in many of their products.

In fact, many industries draw upon Johnson's vast experience in producing a wide range of fine specialty wire for aircraft cord, armature binding, belt lacers, bobby pins, brushes, gutterbrooms, textile machinery, shade rollers, flexible shafts, mandolins, pianos, wire rope, safety pins, staples, metal stitching, tire beads, MB hard drawn and oil tempered spring wire and music spring wire.

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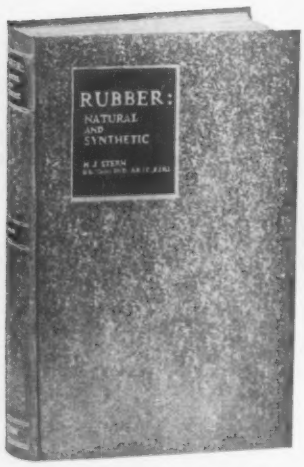

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Natural and Synthetic

By H. J. STERN

B.Sc., Ph.D., A.R.I.C., F.I.R.I.

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About the Author—

Dr. Stern has been engaged as a chemist in the rubber industry for more than 25 years and since 1935 has practiced successfully in London as a Consultant. He is the author of "Practical Latex Work" and of many publications concerned with the scientific and technological aspects of natural and synthetic rubber.

SUMMARY OF CONTENTS BY CHAPTERS

Part I

1. Historical Introduction; Mastication; Vulcanization.
2. Plantation Rubber.
3. Natural Rubber: Composition, Reactions, Derivatives.
4. Properties of Vulcanized Rubber.
5. Compounding Ingredients.
6. Rubber Machinery; Solvents and Solutions; Reclaiming.
7. Latex.

Part II

8. Synthetic Rubber (History and Development).
9. Manufacture and Technology of Synthetic Rubbers.
10. Synthetic Rubber Latices.
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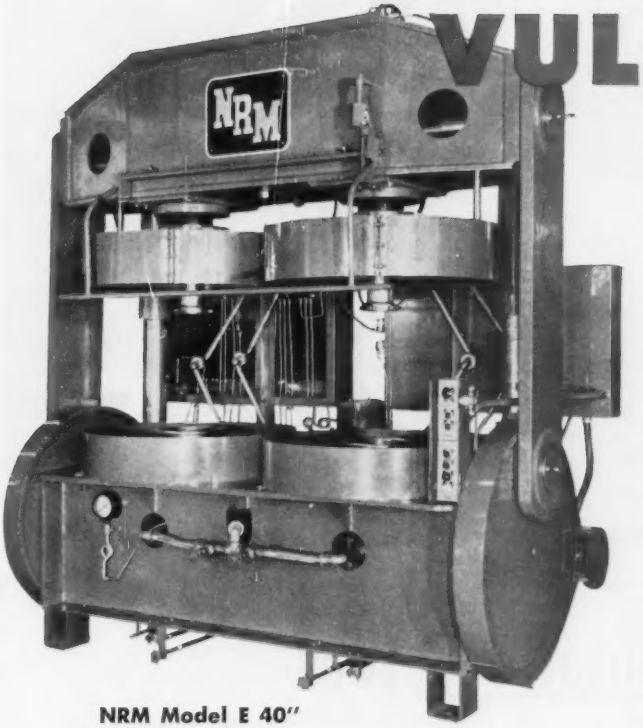

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Rubber Age

Vol. 79, No. 1 **APRIL, 1956**

Electrical Potentials in Rubber Compounding

By R. S. HAVENHILL, L. E. CARLSON, and J. J. RANKIN

St. Joseph Lead Company, Monaca, Penna.

THE electrical potential on various materials, in the form of static electricity, has been known for years. However, static electricity has been considered primarily as a fire hazard *(1)*, a source of radio interference *(2)*, etc., and relatively little work has been done relating the electrical potentials *(9)* with the chemical and physical properties of the materials involved. This has been due in part to the use of inadequate measuring equipment. In fact, it has only been quite recently, with the aid of improved measuring equipment *(3)*, that it has been possible to show a relationship between the electrical charge on a pigment and its milling and reinforcing action in rubber.

A study of electrical potentials has led to the belief that all materials in nature can be arranged in an electrostatic contact potential series and the particular place of each in the series depends on the composition of the material. Rubber is at the negative end of the scale, while the reinforcing agents, such as zinc oxide and carbon black, are at the more positive end of the scale.

It is well-known that like charges repel and unlike charges attract, so it might be expected that if a highly positive material, such as, say, zinc oxide or carbon black, were milled into negative rubber, strong electrostatic attractive forces would be set up which might give rise to reinforcement. This was found to be the case. In general, the more positive the reinforcing agent, the greater the reinforcement and the more positive the resulting stock. This is the basis for the Electrostatic Contact Potential Theory of Reinforcement, in which reinforcement is explained on the basis of the strong electrostatic attractive forces between the positive (+) pigments and the negative (−) rubbers.

The development of these contact potentials was demonstrated with the new Electrostatic Modulator by pressing together a sample of silicone rubber and a sample of natural rubber. Electronic rearrangement took place so that when the samples were separated the natural rubber was found to be positive and caused a red light to go on when brought close to the modulator unit. The silicone rubber had a negative charge, which caused the green light to go on. Silicone rubber has a very low tensile strength which was indicated by this highly negative charge.

Measurement of Contact Potentials

A sectional view of the basic modulator unit is shown in Figure 1. The charge on the specimen flows to the charge plate, which sets up electrostatic lines of force over to the grid plate. These lines of force, or this electrostatic field, are cut or modulated by the motor-driven fan, producing the AC voltage which is amplified with an audio amplifier and measured on a meter in the output circuit.

Since the contact potential is dependent upon the medium or other surface contacting the specimen, a standard reference surface is necessary to contact all specimens and to which all contact potentials can be referred. Figure 2 is a line drawing of the plunger contact potential apparatus for measuring the potentials of cured rubber tensile sheets. A mirror-surfaced steel plunger is

Note: This article is based upon a series of talks given by Mr. Havenhill before various local rubber groups as well as lecture courses sponsored by some of these groups.

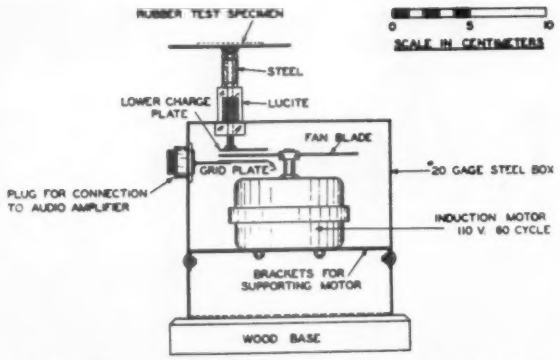

FIG. 1—Sectional view of Electrostatic Modulator.

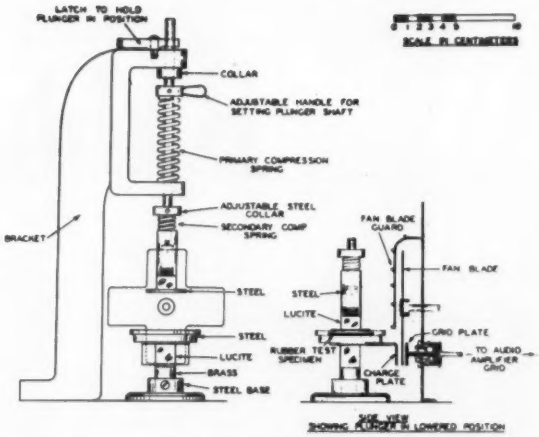

FIG. 2—Schematic of plunger contact potential apparatus.

the reference surface and contacts the sample with a constant force furnished by the coil springs. On release of the plunger, it will be found to have a positive (+) charge and the rubber will have an equal negative (−) charge. The negatively charged specimen sets up an electrostatic field between the charge and the grid plates which is cut or modulated by the motor-driven fan. The resulting pulsating direct current voltage is amplified by the audio amplifier and measured by a meter in the output circuit. Figure 3 shows the equipment, which includes the modulator unit along with the audio amplifier and output meter.

In order to confirm the Electrostatic Contact Potential Theory of Reinforcement, contact potentials and tensile strengths were measured on a wide variety of cured natural rubber and GR-S compounds using various volume loadings of zinc oxide, carbon black, clay, and whiting. The results have been plotted for the GR-S compounds and are shown in Figure 4. Similar results were obtained with the natural rubber compounds and indicate good correlation of contact potential and tensile strength, which substantiates the theory.

As a further check on this theory *(4)* 30 parts of an organic resin which was known to have a highly positive (+) charge were milled into GR-S to determine whether it would increase the tensile strength. This material was polymerized trimethyldihydroquinoline, which is an antioxidant and is normally used in concentrations of 1 to 3% in natural rubber and GR-S. The rate of cure curves and stress-strain data are shown in Figure 5 for both compounds with and without the resin. The fivefold increase in tensile and modulus again confirms the theory.

Figure 6 shows the contact potentials for natural rubber and GR-S at elevated temperatures *(5)* and it will be noted that the contact potential for GR-S becomes highly negative at elevated temperatures. This boiling off or release of electrons and resultant disruption of electrostatic attractive forces within the material, which is much greater for GR-S than for natural rubber, probably accounts for the low hot tensiles of GR-S. Since the theory predicts that the more positive the contact potential the higher the tensile strength and, vice versa, the more negative the contact potential the lower the tensile strength, these data offer further confirmation.

In order then to reinforce GR-S at elevated temperatures, a highly positive material is needed which will at-

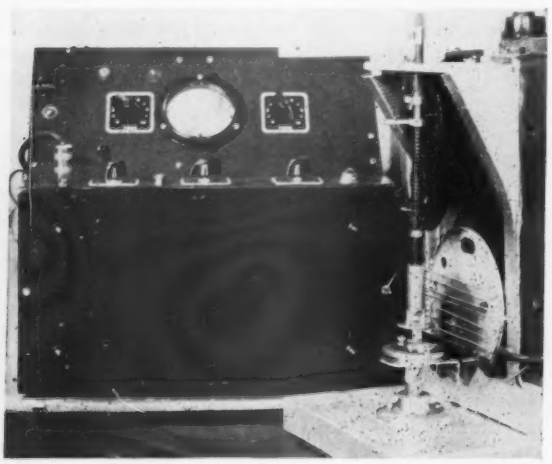

FIG. 3—Photograph of plunger contact potential apparatus.

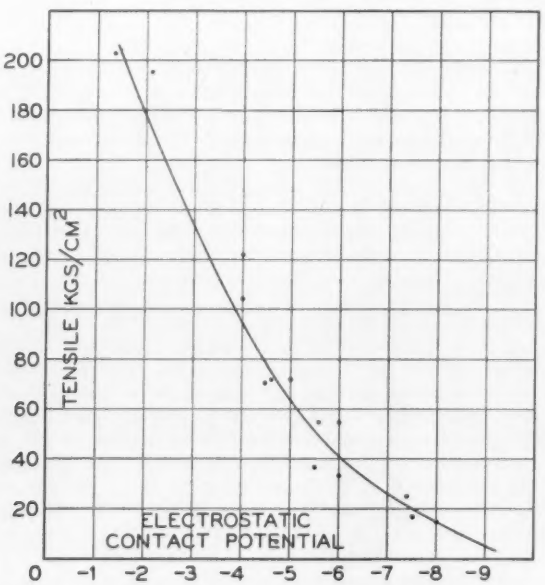

FIG. 4—Contact potential versus tensile for GR-S.

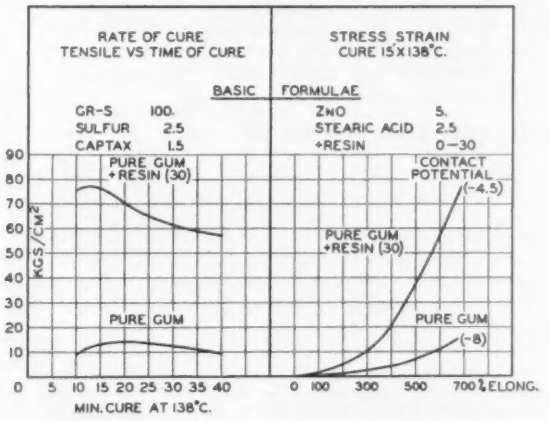

FIG. 5—Rate of cure and stress-strain values.

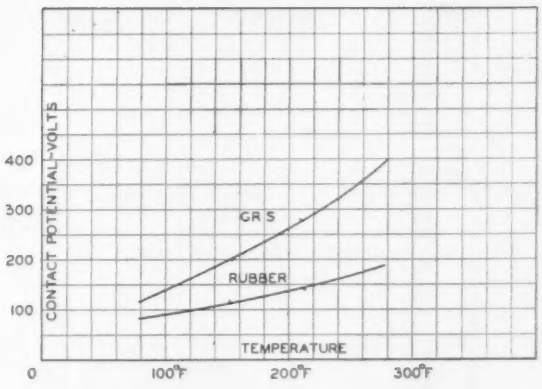

FIG. 6—Contact potential of natural rubber and GR-S at elevated temperatures.

tract these electrons and prevent their escape. Figure 7 shows that the addition of sodium silicate to the GR-S when in the latex form does make the stock more positive at all temperatures. Figure 8 shows the increase in tensile strength of the sodium silicate stock at all temperatures. These data again confirm the original theory.

As a final check on the theory, contact potentials on a wide variety of materials, including glass, have been plotted against tensile strengths (Figure 9). Note that as the contact potential becomes more positive (+), the tensile strength increases. The potential for glass is highly positive, +3000 volts, and if the curve is extended it could be predicted from contact potential data that the tensile strength of glass would be well over a million pounds per square inch. This value has recently been reported in research on fine glass filaments.

Contact Potentials in Banbury Mixing

Since the electrostatic contact potentials were found to be of such great importance in the reinforcement of natural rubber and GR-S, it was felt that the electrostatic charge of the rubber during mastication in the Banbury would be of equal importance in studying pigment dispersion and incorporation rates. This was found to be the case *(6, 7)* and, by observing the changes in electrical potential of the batch, the breakdown of rubber, the time for incorporation of pigments and oils, and the proper sequence and timing of the milling operations could be determined without raising the ram or otherwise disturbing the mixing operation.

A view of the Electrostatic Modulator, which is covered by patent *(8)*, mounted on a Size B Laboratory Banbury is shown in Figure 10. The unit consists of four parts: (1) The electrostatic probe, which picks up the electrical charge from the rubber; (2) The electrostatic modulator, which changes the DC charge into an AC voltage; (3) The audio amplifier, which amplifies the AC or pulsating DC voltage; (4) The recorder, which records the strength of the AC voltage which is, of course, proportional to the strength of the electrical charge on the rubber.

A line drawing of the probe is shown in Figure 11. It is mounted flush with the inner wall of the mixing chamber and is continuously in contact with the rubber batch. The contacting surface of the steel probe is mirror-surfaced, and the probe is insulated with a Lucite sleeve.

A line drawing of the modulator head is shown in Figure 12. The charge from the probe charges the steel charge plate, which establishes electrostatic lines of force to the grid plate, which connects to the grid of the audio amplifier. The electrostatic field between the two plates is cut or modulated by fan No. 1, producing the AC voltage. Motor-driven fan No. 2 is for polarity indication.

A schematic diagram of the equipment is shown in

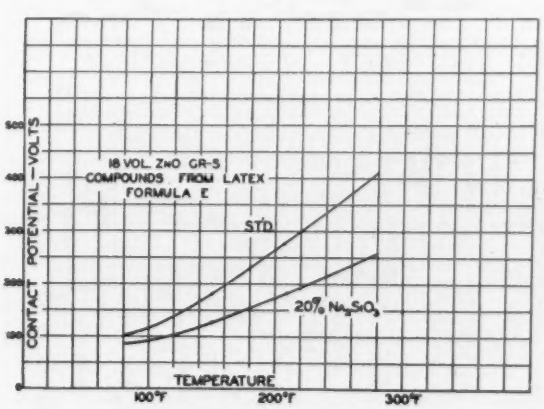

FIG. 7—Contact potential versus temperature for sodium silicate stock.

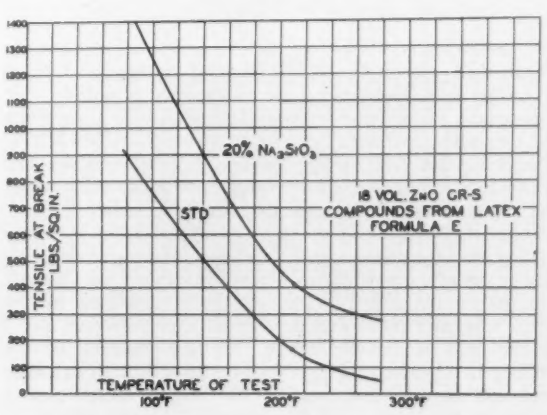

FIG. 8—Tensile versus temperature for sodium silicate stock.

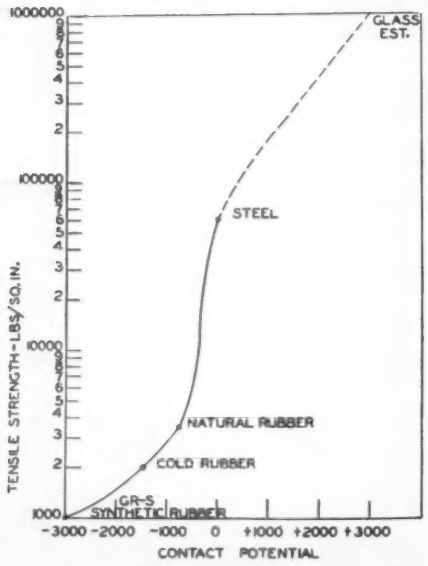

FIG. 9—Tensile versus contact potential for various materials, including glass.

FIG. 10—Photograph of electrostatic probe and associated equipment mounted on a laboratory Banbury.

Figure 13. The −90 volt DC bucking voltage is supplied from the 6AL5 rectifier tube in the power supply. It produces a negative reference electrostatic field between the two plates, which is cut or modulated by fan No. 2, producing an AC voltage which is amplified by the 6SN7 tube. The amplified voltage is then passed through the phase control to the grid of the 6N7 tube.

The DC electrostatic voltage from the rubber is picked up by the probe and establishes an electrostatic field between the other two plates which is changed into an AC voltage by fan No. 1. The voltage is amplified by the 6SJ7 tube and is combined with voltage from fan No. 2 at the grid of the 6N7 tube. If the potential of the rubber is negative, the two AC voltages will be in phase and will be additive, causing the output meter pen to move to the right. If the potential of the rubber is positive, the two AC voltages at the grid of the 6N7 tube will be 180° out of phase and will tend to neutralize each other, causing the output meter pen to move to the left. R26 is to prevent a permanent charge from accumulating on the charge plate. This device provides an apparatus which records both the magnitude and polarity of the charge on the rubber.

Results Obtained with Modulator Unit

Figure 14 is a typical electrostatic breakdown curve for natural rubber masticated in the Banbury. The rubber starts with a highly negative potential (−200 volts), which becomes less negative and finally becomes positive after about eight minutes' mastication. This loss of electrons indicates an oxidation reaction. The second curve is for natural rubber masticated in a hot Banbury and is of similar shape.

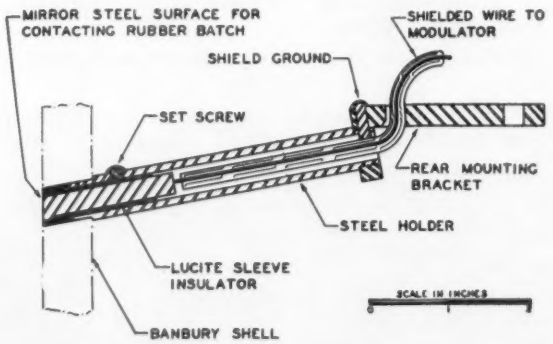

FIG. 11—Electrostatic probe.

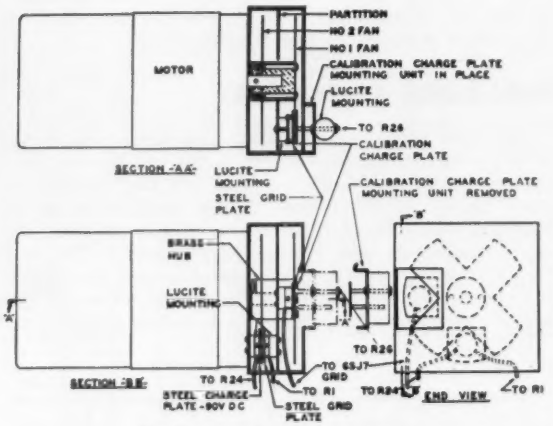

FIG. 12—Modulator head.

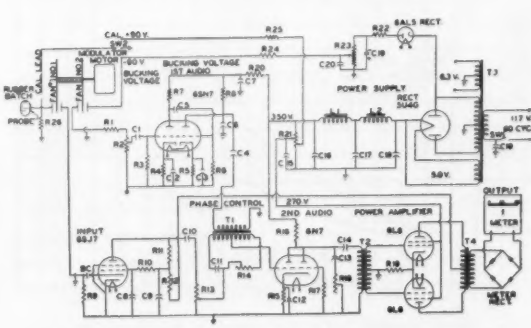

FIG. 13—Schematic of audio amplifier.

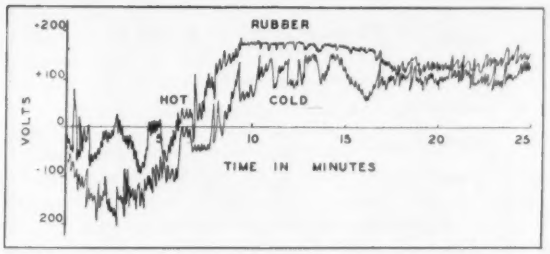

FIG. 14—Electrostatic mastication chart for natural rubber.

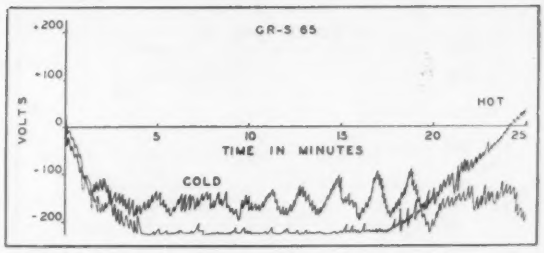

FIG. 15—Electrostatic mastication chart for GR-S type rubber.

Figure 15 is an electrostatic breakdown curve for GR-S. It also starts with a highly negative potential, but does not change much as mastication proceeds. The second curve is for a hot Banbury and shows that the GR-S does become less negative and finally becomes positive toward the end of the mastication cycle.

Figure 16 is an actual photograph of the Esterline-Angus recorder chart and shows what happens to the potential of the rubber when 10% of lauric acid is added. The rubber starts with a highly negative potential and when the lauric acid is added the potential drops to zero. This is because the probe inside of the Banbury and the rubber is coated with lauric acid; this causes oil-to-oil contacts which produce no contact potential. Contact potentials are produced only when unlike materials are contacted and separated such as rubber and reinforcing agents.

As soon as all of the oil is worked in, normal contact potential for the oil-rubber batch and the clean probe is established, which is highly negative. This abrupt change in contact potential serves as a means of determining when the mixing is complete and corresponds very closely with the "sucking" sound which manifests itself at times on completion of the mixing cycle.

Figure 17 is an electrostatic mixing chart for mineral oil. Mineral oil makes the stock slightly less negative, as contrasted with lauric acid, which makes it more negative.

Figure 18 shows that linseed oil makes the batch more positive. The results indicate the importance of the

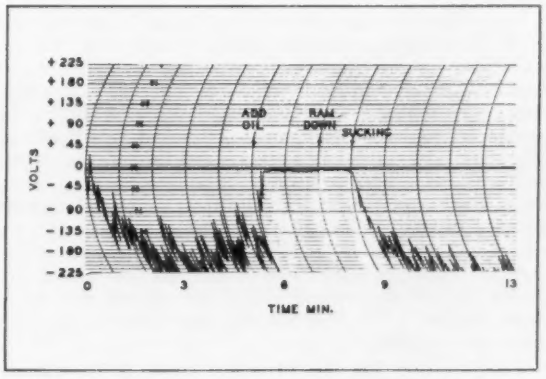

FIG. 16—Electrostatic incorporation chart for lauric acid.

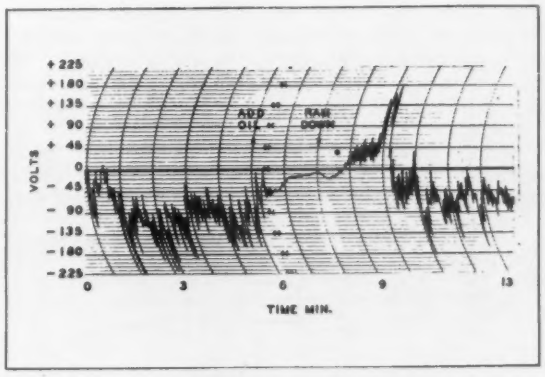

FIG. 17—Electrostatic incorporation chart for mineral oil.

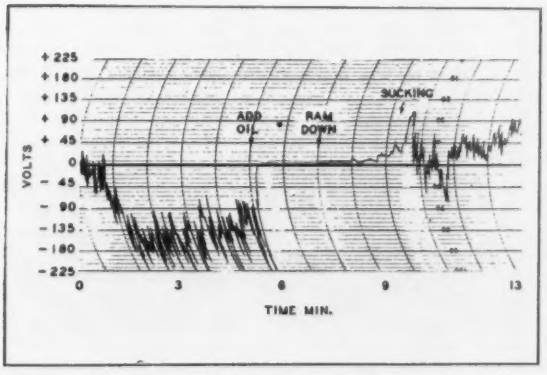

FIG. 18—Electrostatic incorporation chart for linseed oil.

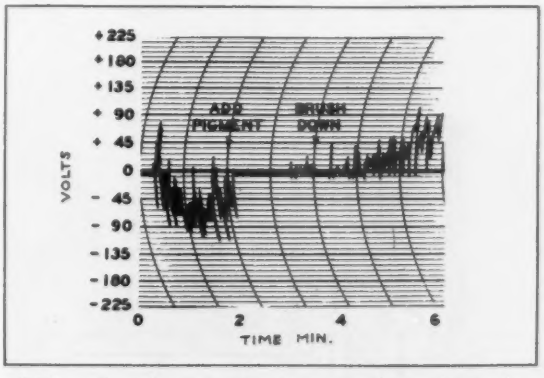

FIG. 19—Electrostatic incorporation chart for Thermax.

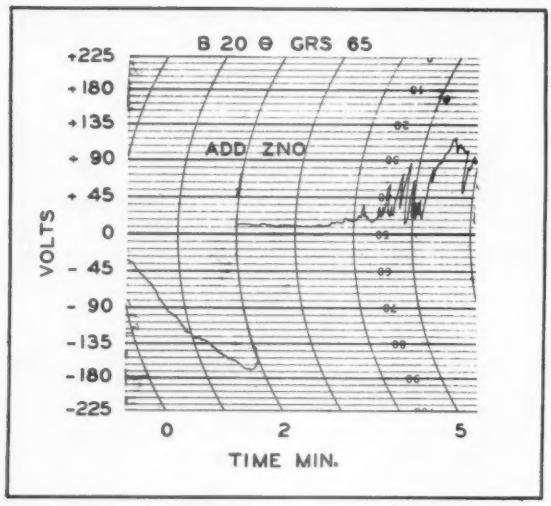

FIG. 20—Electrostatic incorporation chart for Black Label No. 20 zinc oxide.

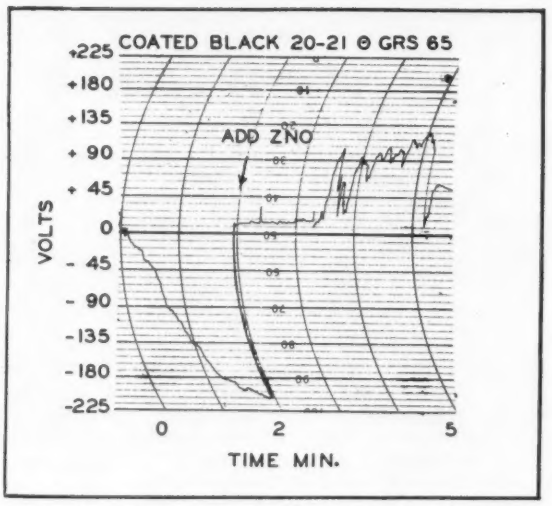

FIG. 21—Electrostatic incorporation chart for Black Label No. 20-21 zinc oxide.

electrostatic curves in determining the proper sequence of the mixing operations.

In general, those softeners which make the rubber more negative (−), such as lauric acid, should be added prior to the addition of the positive (+) reinforcing pigment in order to take advantage of the strong electrostatic attractive forces present. Softeners which make the rubber positive (+), should be added after the positive (+) reinforcing agent so as not to encounter the repulsive action of the positive fields. On this basis, mineral oil should be added after the pigment, because it does make the stock slightly less negative.

Figure 19 shows an electrostatic mixing chart for 20 volumes of Thermax black. The zero potential, or flat portion of the curve, is due to pigment-to-pigment contacts, which produce no contact potentials. As soon as all the black is incorporated, the new positive contact potential of the rubber black masterbatch is obtained.

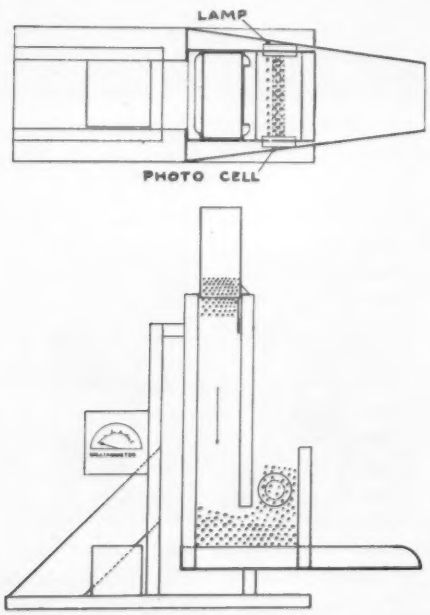

FIG. 22—Zinc oxide dust apparatus.

Electrical Potentials of Coated and Pelletized Zinc Oxide

Figure 20 shows a typical mixing chart for a 50% zinc oxide-GR-S 65 masterbatch. The zinc oxide used was St. Joe Black Label No. 20 with a particle size of 0.20 micron. The GR-S masticating alone possesses a highly negative potential. On addition of the zinc oxide, the charge becomes zero due to pigment-to-pigment contacts. After the pigment is completely incorporated, the charge builds up to a highly positive value. Since the GR-S has a highly negative charge and the zinc oxide a highly positive charge, it might be expected that the strong electrostatic attractive forces between the two would promote rapid incorporation of the zinc oxide. If this theory is valid, by making the charge on the zinc oxide more positive (+), it should be possible to increase its incorporation rate.

Figure 21 is the electrostatic mixing curve for the same zinc oxide which has been surface-treated to give it a more positive charge. It does incorporate more rapidly—1.5 minutes as against 2.5 minutes for the uncoated material—thus confirming the Electrostatic Mixing Theory. The zinc oxide dispersion was also improved; this is thought to be due to the fact that the coated zinc oxide particles all have the same positive (+) charge and repel each other, thus preventing agglomeration. Zinc oxide when produced contains both positive and negative particles due to the presence of absorbed and occluded sulfur gases. Due to the attraction between the positive (+) and negative (−) particles, loose agglomerates may be formed which must be broken down before good dispersion can be obtained.

In addition to improved dispersion and decreased mixing time, the coated zinc oxide (Black Label No. 20-21) also produces lower mixing temperatures and up to 20% savings in power consumption. It also has a higher apparent density which means less storage space is required.

While the advantages of the coated zinc oxides are very real, the coated material has a serious disadvantage, namely, increased dusting in both the compounding and

mixing operations. This is, of course, due to repulsion of the positively charged zinc oxide particles.

Fortunately, it was possible to develop a process for converting zinc oxide into pellet form. The pellets are a little over 1/32 of an inch in diameter and are free flowing. They not only substantially eliminated the dusting problem, but also gave a new product having additional advantages in improved factory handling, increased cleanliness, storage space savings, and more rapid incorporation in rubber due to less bulk and more rapid application of Banbury ram pressure.

The coated zinc oxide and pellet development has, however, brought about the need for new equipment to measure both the dusting and hardness of pellets. If the pellets are too hard, they will not disperse properly; if too soft, they will break up during transportation, will be dusty, and will lead to customer complaints.

Figure 22 is a line drawing of the apparatus for measuring the dustiness of pigments. The hopper is filled with a given weight of pigment to be tested. On release of the gate, the zinc oxide drops down the one column and the dust rises in the other column, reducing the amount of light reaching the photo-voltaic cell. This causes a reduction in current from the photocell, which is read on a milliammeter in the circuit. The reduction in reading is in direct proportion to the amount of dust present. The milliammeter is initially set for 100 by means of an adjustable meter shunt. This corresponds to no dust. A zero reading on the meter, then, means all dust. While it was known that Black Label No. 20-21 coated zinc oxide was dusty, the extent of this was not realized until it was tested on the new equipment.

Figure 23 is a bar graph which shows the results of tests on some zinc oxides with the new equipment. The Black Label No. 20 zinc oxide gave a dust index of 50, which might be expected from such a fine particle size pigment. The dust index for the Black Label No. 20-21 zinc oxide was nearly zero, which means all dust.

Our first pellets had an index of 75, which is quite an improvement. Present production is around 80 to 90, while in the laboratory, material has been made with a 98% index.

A photograph of the new torsion wire apparatus for measuring pellet hardness is shown in Figure 24. Individual pellets to be tested are placed under the anvil. On raising the handle, the anvil is made to exert force on the pellet through the torsion wire. The angle through which the handle must be moved to crush the specimen is taken as the hardness or crushing strength. A linear relationship was found to exist between the angle of twist and the force exerted by the anvil. The angle readings

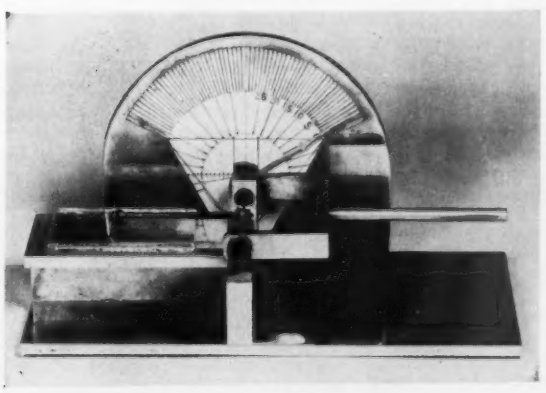

FIG. 24—Zinc oxide pellet hardness tester.

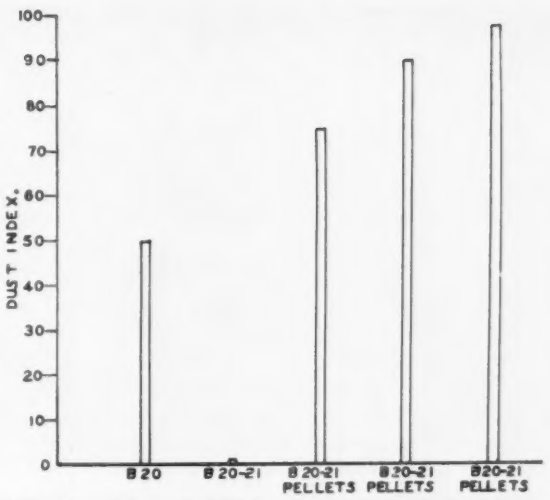

FIG. 23—Bar graphs of dust indices for uncoated, coated, and pelletized zinc oxide.

multiplied by the factor 0.625 give the crushing strength or hardness in terms of grams.

The cross-hatched bars in Figure 25 are pellet hardness values obtained with the new instrument. The first pellets made had a hardness value of 4. It was found possible to increase this to 10 to 14, which is the value for present production. If the pellets are much harder than this, they may not disperse in extremely soft stocks; if they are much softer, they may break up in transit. The plain bars are apparent density figures and show the increase in apparent density on coating and pelletizing the fine particle size zinc oxide. The increase from 22 to 80 pounds per cubic foot means that three to four times as much zinc oxide can be warehoused in the same space.

Summary and Conclusions

In summary, the electrical charges, or contact potentials, play an important role in rubber compounding.

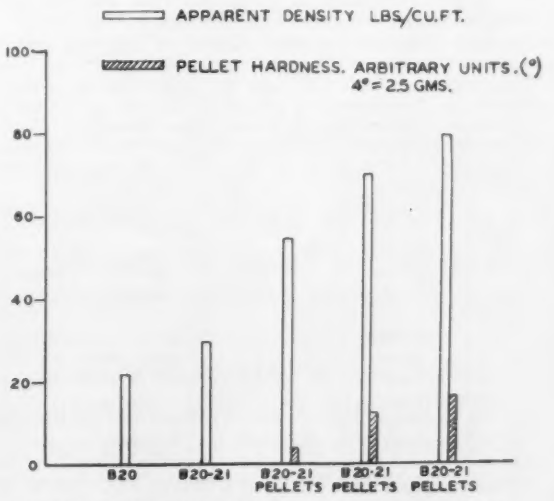

FIG. 25—Bar graphs of zinc oxide pellet hardness and apparent density of various zinc oxides.

In reinforcement, the strong electrostatic attractive forces between the positive pigments and the negative rubber are the basis for reinforcement and the more positive the pigment, the greater its reinforcing action in rubber.

Since the contact potential is specific for each compounding ingredient, by using the Electrostatic Modulator on the Banbury an operator can not only follow the mixing operation, but can evaluate the uniformity of rubbers, softeners, and pigments during the mixing cycle.

In conclusion, the electrostatic charge plays an important role in coated and pelletized zinc oxide, which, in turn, is reflected in improved quality through better dispersion and lowered costs through reductions in compounding and mixing time.

ACKNOWLEDGMENT

The authors wish to acknowledge the valuable assistance of the staff of the research laboratory of the St. Joseph Lead Company and particularly that of John G. Wehn, plant manager, H. F. Emery, J. A. Reising and L. J. Behan, who have contributed to the preparation of this paper.

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(2) Cadwell, S. M., Handel, N. E., and Benson, G. L., *Ind. Eng. Chem. (News Ed.)*, Vol. 19, p. 1139 (1941).
(3) U. S. Pat. 2,516,984.
(4) Havenhill, R. S., O'Brien, H. C., and Rankin, J. J., *J. Applied Phys.*, Vol. 15, p. 731 (1944).
(5) Havenhill, R. S., O'Brien, H. C., and Rankin, J. J., *Ibid*, Vol. 17, p. 338 (1946).
(6) Havenhill, R. S., Carlson, L. E., Emery, H. F., and Rankin, J. J., *Trans. Inst. Rubber Ind.*, Vol. 27, p. 339 (1951).
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(8) U. S. Pat. 2,587,156.
(9) Skinner, S. M., and Gaynor, J., *Plastics Technology*, Vol. 1, p. 626 (1955).

ADDENDA AND CORRECTIONS ON THE 1955-56 RUBBER RED BOOK

THE compilation of data for a directory which runs over 1250 pages in size is a tremendous undertaking. No matter how careful the compilers may be a few errors creep in and some omissions occur. Sometimes changes in personnel take place between the time basic information is furnished and actual publication. Because of these many factors we are listing below some changes, corrections, additions, etc., which apply to the 1955-56 RUBBER RED BOOK. In the interest of accuracy, it is suggested that holders of this edition indicate these in their respective copies.

Page 65: Electric Auto-Lite Co., Wire and Cable Division—Change title of J. H. Thornton to Assistant Plant Manager. Add R. Donaghy as Production Manager. Notes: (a) Company also produces press-cured molded rubber goods in addition to wire and cable; (b) Company maintains branch plant at Hazleton, Penna., with Phil Snyder as Production Superintendent and J. Havrilla as Purchasing Agent.

Page 85: Gora-Lee Corporation—Change telephone number to Drexel 8-0418.

Page 95: Ideal Roller & Manufacturing Co.—Add Leslie Phillips as Factory Manager at the Atlanta Plant and Roy Henrichs as Factory Manager at the Huntington Park Plant.

Page 133: Okonite Co.—Under "Executive Personnel" delete Edward D. Youmans (deceased) and J. D. Underhill as Vice-Presidents and Norman E. Lang as Comptroller. C. C. Benedict is now Controller. Add Kenneth T. Gordon as Director of Purchases. Under "Passaic Plant" delete Thomas Williams, Kenneth T. Gordon and R. B. Blodgett. Under "Paterson Plant" delete Harry L. Beede and add R. B. Blodgett as Research Director.

Page 148: R.C.A. Rubber Co.—Add W. H. Phillips as Chief Chemist.

Page 155: Rubber and Asbestos Corp.—Change listing to show Bernard Sugarman as President and Elliot H. Greene as Secretary-Treasurer. The company now employs 125 people. Products now include natural and synthetic rubber and resin-based cements and industrial adhesives.

Page 184: Virginia Specialty Corp.—Company name has been changed to Virginia Chemical Corporation. Products now include foil laminants.

Page 204: Kaufman Rubber (Ontario), Ltd.—Add the following to the list of products: Footwear (of all types).

Page 879: Under "Paper" delete the Trenton Office from the listing of the Paterson Parchment Paper Co. The company has offices in Chicago and New York and operates a West Coast Plant at Sunnyvale, California. Make the same deletion under "Separating Materials" on Page 894.

Page 958: Change the address in the Barrett & Breen Co. advertisement from 50 Congress Street to 80 Federal Street, Boston 10, Mass. The new telephone number is Hancock 6-2563.

Additions to the Who's Who Section

Page 1017: Mrs. E. W. Block, Sales, H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1025: T. A. Bulifant, Research Lab., Barrett Division, Allied Chemical & Dye Corp., Edgewater, N. J.

Page 1027: D. W. Burson, Sales, H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles 58, Calif.

Page 1049: Mary Jane Dilts, Office Mgr., Wyrough & Loser, 801 Broad St. Bank Building, Trenton, N. J.

Page 1072: T. J. Glennon, Sales Rep., H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1094: R. L. Hurst, Sales Rep., H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1116: M. H. Leven, Pres., State Rubber & Chemicals Co., Inc., 20 East 16th St., New York 3, N. Y.

Page 1116: Robert D. Leven, Gen. Mgr., State Rubber & Chemicals Co., 20 East 16th St., New York 3, N. Y.

Page 1119: Thomas N. Loser, Partner, Wyrough & Loser, 801 Broad St. Bank Building, Trenton, N. J.

Page 1121: E. J. Lynch, Sales Rep., H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles 58, Calif.

Page 1125: D. L. McKeen, Sales Rep., H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1126: E. C. McLaughlin, Sales Rep., H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles 58, Calif.

Page 1142: Peter P. Murawski, Development Engineer, Elastomers Division, E. I. du Pont de Nemours & Co., 40 Worth St., New York 13, N. Y.

Page 1161: Mrs. E. M. Rakers, Sales, H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1170: E. L. Royal, Vice-Pres. & Branch Mgr., H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles 58, Calif.

Page 1170: H. M. Royal, Pres., H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1170: H. M. Royal, III, Sales Rep., H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1181: Charles Sheehan, Treas., General Fibre Co., South St., Walpole, Mass.

Page 1181: John Sheehan, Vice-Pres., General Fibre Co., South St., Walpole, Mass.

Page 1186: Miss H. E. Smith, Sales, H. M. Royal, Inc., 689 Pennington Ave., Trenton 1, N. J.

Page 1222: George Wyrough, Partner, Wyrough & Loser, 801 Broad St. Bank Building, Trenton, N. J.

Page 1249: Change reference to the advertisement of Vansul & Company from 524 to 534.

Moderator and Panelists for the Symposium on Rubber in Modern Transportation

Rubber Meets the Challenge of Modern Transportation

Report of a Symposium Sponsored by the Akron Rubber Group

THE Winter Meeting of the Akron Rubber Group, held in Akron, Ohio, on January 27, 1956, featured a Symposium on "Rubber Meets the Challenge of Modern Transportation." The symposium was moderated by J. D. D'Ianni of the Goodyear Tire & Rubber Co. and the panelists included the following: E. W. Bartholomew (Wright-Patterson Air Force Base), W. J. Simpson (Chrysler Engineering), J. J. Allen (Firestone), B. M. G. Zwicker (Goodrich Chemical), R. W. Malcolmson (DuPont), and H. G. Evans (Enjay).

In his introductory remarks, Dr. D'Ianni stated that it is not a new story for the rubber industry to grapple with, and vanquish, increasingly difficult problems. He went on to say that in recent years the pace has been so fast that one tire engineer was quoted in a recent issue of the *Wall Street Journal* as follows: "We have to run like hell to keep standing still."

The answers to many of the future problems, the moderator continued, obviously lie in research and development of basic new raw materials by polymer chemists, although the contribution made by the rubber compounders and designers is also an important factor.

Dr. D'Ianni posed a number of questions to the panel. Can the rubber industry meet the challenge with which modern transportation is confronting it now, as well as the more demanding requirements which surely lie ahead? Can significant improvements be made, primarily through synthetic approaches, in resistance to solvents and jet fuels, high and low temperatures, ozone, sunlight and other environmental agents of degradation? Can these things be done without sacrifice in other desirable properties, such as resilience and resistance to abrasion and flex cracking? The moderator stated that the answer today cannot be an unqualified yes. However, he continued, the history of the past twenty years suggests that the field of high polymers is still a most fruitful one for experimentation, and the rubber industry can face the future with guarded optimism.

The papers given by the panelists, as well as the questions and answers which followed the panel discussion, are presented herewith.

The moderator says: "The answers to many of the future problems of rubber in the transportation industry obviously lie in research and development of basic new raw materials by polymer chemists, although the contribution made by rubber compounders and designers is also an important factor."

A Challenge from the Aircraft Industry

By E. W. BARTHOLOMEW
Wright-Patterson Air Force Base, Ohio

AS a representative of the Air Force, I am not sure that it is correct for me to present the challenge from the aircraft industry for rubber products. In reality, it is the Air Force which presents the challenge to the aircraft industry to meet specified performance characteristics such as speed, range, altitude, reliability, and pay load. Under the present Weapons Systems Concept, the Air Force encourages the industry to seek solutions to the problems which will be encountered in the attempt to meet these performance characteristics.

However, to assist the aircraft industry in general problem areas, the Air Research and Development Command has included as one of its functions the basic development of new materials of construction including metals, ceramics, plastics, fluids, polymers, rubber, etc. Since the group I represent is engaged in such development to meet anticipated aircraft requirements, a review of these should constitute the challenge to the rubber industry.

While it will be recognized that I am primarily concerned with military applications, I'm sure it will also be realized that developments for military use are usually quickly transferred into civilian or peacetime applications—for example, the jet transports of the near future.

Environmental Conditions

Basically, the only difference between the demands of the aircraft industry and the automotive industry for rubber products lies in the extreme difference of environmental conditions to which the parts may be exposed. Both industries require tires, hose, O-rings, weather seals, sealants, adhesives and other miscellaneous elastomeric components. However, unlike the automobile, the rapid failure of even such a simple rubber part as a door or canopy seal on a vehicle flying at high altitude could conceivably result in very serious consequences if a loss of vital pressurization occurred. Such failure, which is not infrequently encountered in an automobile, could readily be caused by ozone deterioration, loss of flexibility at low temperatures, or loss of adhesion to the aircraft structure. Therefore, my first, and relatively simple, challenge to the rubber industry is to overcome these age-old deficiencies of rubber products.

Next, let us examine the really tough requirements of the aircraft industry. In a paper delivered at a recent meeting of the Rubber Manufacturers Association, Major H. C. Hamlin made a statement to the effect that man has virtually solved all the problems of flight from here to anywhere, at any speed, except the problem of materials from which to make the vehicles. While his statement was intended to include all materials of construction, we will consider only that material in which we are interested—rubber.

As an example, at Mach 3.0, which probably represents a speed of a little better than 2000 MPH at 50,000 to 60,000 feet, it is expected that the skin temperature of an airplane or missile will reach equilibrium at around 500° to 600°F. Now there is little doubt that propulsion systems will permit us to attain this speed, or far beyond it, but what are we going to use to make this vehicle air tight? In other words, what will we use for door seals, bomb bay door seals, sealants, etc.? What are we going to use for the fabrication of tires which will probably be stored, during flight, in thin wings, preferably without the benefit of complex and heavy cooling equipment? What fuel-resistant rubbers do we have for fabrication of tanks, seals, hose, and sealants which will withstand these temperatures? And, finally, what about O-ring seals, hose and other rubber parts for the indispensable hydraulic and lubrication systems which contribute additional heat of their own during operation in high performance aircraft?

That this latter problem is very acute becomes apparent when we consider that there may be 500 to 1000 O-ring seals in the hydraulic system of a modern, relatively small fighter aircraft. While present rubber technology can possibly permit us to obtain one or two satisfactory flights under conditions where really high temperatures are encountered, the tremendous maintenance problems involved make operational suitability very questionable. For this reason, I would like to emphasize that we are not saying "give us a 600°F. rubber or nothing." Any substantial gains in the improvement of high temperature performance of elastomers without too much sacrifice in other properties will be of great benefit.

Likewise, any improvement in the heat resistance of aircraft tires will be of considerable importance. In this case, we are most concerned with such properties of a tire as strength, abrasion resistance, tread and ply adhesion, etc., when the tire is already preheated at touch-down. While many factors, such as speed, load, number of landings and age of the tire must be considered, tests at Wright Air Development Center have indicated that present aircraft tires may be expected to be marginal in performance at temperatures above 250°F. This may mean that the safety factor is reduced, the service life of the tires may be reduced or, in certain cases, the tire may fail on landing. Therefore, any improvement in the physical properties of elastomers while at elevated temperatures should be of great help toward solving the problems of tires for supersonic aircraft.

Heat Is Essential Challenge

Approaches such as insulation and cooling of wheel wells, use of heat reflective coatings and others are under consideration, but it should be pointed out that any solution which requires even one pound additional weight, or additional space, is most undesirable. If we were to stop with the present materials development, it is quite conceivable that the day would come when as much horsepower would be required to cool vital components as would be required to propel the vehicle. This is a situation which we cannot afford to permit.

It therefore becomes apparent that heat will pose the next and greatest challenge to the rubber industry. Meeting this challenge, I am sure, will tax the best brains of the research groups, since we already have specific requests for elastomeric materials which will withstand temperatures well above the previously mentioned 600°F. In view of this, I see no reason to go

into great detail on the additional problems resulting from the exposure of rubber components to new and unusual fuels, lubricants and hydraulic fluids now under development, or to radiations from nuclear power plants, or to other special environmental conditions. All of these problems must be met after the most serious limitation of rubber-thermal stability has been overcome.

In conclusion, I would like to point out that in the past the rubber industry has always "come through" with solutions to critical aircraft rubber problems. The aircraft industry expects the rubber industry to continue to furnish the necessary solutions to such problems. As has been pointed out, even marginal gains will be welcome, since in many cases they will result in higher performance, improved service life, or elimination of a critical design problem where it has become necessary to completely remove rubberlike materials from a system.

In an effort to solve many of these critical rubber problems, the Air Research and Development Command has engaged excellent laboratories to work under contract in an effort to expedite a solution to the problems outlined. Such work is being directed toward the development of new polymers, the development of new compounding ingredients or techniques, and the fabrication of improved end items. Wright Air Development Center is always interested in discussing any new, sound approaches to the solution of rubber problems of air weapons. Perhaps in this manner we differ from the automotive industry since we recognize that many of the rubber products urgently needed will not involve a sufficient volume demand to establish the required profit motive for the rubber industry. In such instances, the Air Force or the aircraft industry must accomplish, or sponsor, needed development.

One last personal observation: Some day space travel will become a reality. I leave to the imagination the type of rubber problems which will then pose the challenge to the rubber industry.

A Challenge from the Automotive Industry

By W. J. SIMPSON

Engineering Division, Chrysler Corp., Detroit, Mich.

IT is well known that the growth of the rubber industry has paralleled that of the automotive industry, and that rubber has played a tremendous role in the development of the modern automotive vehicle. Without today's pneumatic tires, the automobile could not operate at high or even moderate speed, and would not give its present comfortable ride. However, tires are not the only rubber products that enhance the performance of modern cars. For instance, V-belt drives operate many of the important accessories under the hood—fan, water pump, generator, power steering pumps, compressors, etc. We can hardly conceive of operating modern powerful engines without rubber mountings. The importance of hose to fuel systems and hydraulic accessories hardly needs to be mentioned. Seals for water, oil, fuel, and air all play their parts to make today's excellently performing vehicles possible. In fact, the modern high-speed, comfortable, excellent performing, and beautifully styled vehicle is greatly dependent upon the many elastomeric products it contains.

It is well known that continuous effort is expended in the engineering organizations of all the automotive companies to improve the safety, performance, economy, beauty, and comfort of automobiles. The automotive industry is grateful for the past accomplishments of the rubber industry that have assisted in developing the fine cars of today. However, further contributions from the rubber industry will help to provide the continuous improvement that the motoring public expects. Numerous new elastomers and improvements in compounding and processing have been announced recently. These accomplishments, and more that are on the way, indicate that the rubber industry will produce new and improved products for use in automotive vehicles.

Problems Confronting the Rubber Industry

Long Life Tires: A great deal has been said about the "super" abrasion resistance of tire treads made from polyurethane rubbers or other new elastomers. The continued development of new synthetic fibers and the recent announcements of polyisoprene rubbers that duplicate the important properties of natural rubber have also caused considerable discussion. Knowing of these new developments, can it be predicted whether or not the so-called "100,000 mile tire" can be made? The development of super highways, causing the rapid accumulation of high mileage on many automobiles, will make tires with longer useful life very desirable.

Colored Rubber Products: It is well known that there has been an increased emphasis on color in the use of automobiles in recent years. The motoring public has become very color conscious, and is even becoming more or less expert on color harmony. In the light of these trends, color other than black for exposed parts such as window and door weatherstrips, floor mats, pedal pads, grommets, and even tires would seem to be desirable. There undoubtedly will be increased pressure on the rubber industry to develop colored parts such as weatherstrip. Can colored elastomeric products that have good appearance and that possess good depth of color approaching that of a painted surface be developed to satisfy color conscious motorists?

Door Weatherstrips: Most automobile doors are sealed with sponge rubber weatherstrips. The use of sponge rubber for this application has become very popular because it produces soft weatherstrips that take up some doorbody clearance variation, and also because it can be readily attached to the door by cementing. If cellular weatherstrip materials could be developed that are consistently softer than those presently used, weatherstrips could be designed in such a manner that more deflection would occur, thus making it easier to seal automobile doors. Can consistently softer cellular rubber with uniform fine cell structure that does not exhibit plasticizer exudation be produced without sacrifice of resilience?

Weather Resistance of Exposed Rubber Parts: The severity of the effect of weather on rubber parts installed under conditions of strain seems to be increasing. This may or may not be due to high concentrations of ozone in numerous areas. Whatever the reason, the quality of material in rubber weatherstrips has to

be carefully controlled to prevent cracking during exposure to weather. If weather conditions affecting rubber become more severe in specific geographical locations, will rubber materials for exposed body parts continue to perform satisfactorily? It should be borne in mind that these parts should not stain body paints, should process readily on conventional equipment (extruders, etc.), should not be too expensive, and should be capable of being assembled easily in mass production operations.

Synthetic Rubber Fluid Seals: Seals in today's automobiles do an important job under tough conditions. They operate in a variety of lubricants, hydraulic fluids, and fuels, and at temperatures that once were considered too high for rubber products. Seals withstand a large variety of additives that are used in lubricants and hydraulic fluids (active sulfur compounds, halogenated products, phosphates, fatty acids, methacrylates, etc.). As engine-driven accessories are added to all manufacturers' automobiles and trucks, more difficult seal applications may possibly occur. Are seal materials becoming available that will last indefinitely at temperatures up to 400°F. and operate satisfactorily in high octane fuels, and also in lubricants and hydraulic fluids that will contain a large variety of additives?

Low Friction Rubber Compounds: The relatively high coefficient of friction of tire treads against pavement surface is used to advantage in stopping vehicles. However, the development of as low friction as possible between material used in moving seals and the surfaces against which they operate is advantageous for obvious reasons. Can the polymer chemists and compounders of the rubber industry produce materials that have as low friction against metal or glass as do some of the solid materials used in seals and bearings?

Products Manufactured by Latex Dipping Methods: The number of boots and similar parts of complicated shape that are fabricated by dipping forms in latex has been increasing. These types of products are useful where complicated shapes are required, and also for parts of relatively low production. To some extent, latex dipped parts are limited in their performance, because their properties are not always as good as those of molded products, and also because only a limited variety of compounds are available. Can the properties of latex compounds such as oil resistance be improved, and can the available types of latex compounds be increased? Also, can the use of the latex dipping method for fabricating parts be extended to polymers other than natural rubber and neoprene?

The Use of Natural and GR-S Type Elastomers in the Aircraft and Automotive Industries

By J. J. ALLEN

Firestone Tire & Rubber Co., Akron, Ohio

THE future requirements of the automotive and aircraft industries with reference to rubber parts have already been outlined. Reference has already been made to tires, weather seals, fluid seals and similar items as well as to some of the drastic requirements with respect to ozone resistance, high and low temperature resistance and fluid aging under high temperature conditions with new types of oils and additives. This paper will consider both natural rubber and GR-S and will not only discuss what can be achieved with these types of elastomers but will point out their limitations for meeting future requirements.

Reference has already been made to the 100,000-mile tire and to the possible use of polyurethane type rubbers. It is my understanding that research chemists in the rubber and chemical industries are already working on polyurethane for tire use as well as on improved tire fabrics for use with such tires but the development of such a tire is probably some years away considering both technical and economic factors.

Problem in the Tire Field

In the meantime, therefore, we will be dependent on natural rubber and GR-S type rubbers for our tire requirements for some time. I think it is recognized that the building of more and more superhighways will result in longer sustained speeds which in turn brings up the problems of heat resistance and heat dissipation. This involves the tire as a whole, including the fabric, design and construction, in addition to the polymers and compounds. In general, it can be said that natural rubber and GR-S type elastomers, properly compounded, are meeting satisfactorily today's requirements and probably will do so for some years to come, particularly since we have legal speed limits and a reasonable enforcement of them.

Improved Compounds On Way

Rubber compounders are getting the best properties possible from both natural rubber and GR-S, but continued development and research on accelerators, antioxidants, antiozonants, carbon blacks, etc., as well as new and improved types of synthetic elastomers, will in all probability lead to improved compounds. However, any change will be gradual. With respect to the tire problems, co-operation between the consumer and manufacturer will be required with respect to design and construction in order to keep within temperature and other physical limitations.

With reference to the other products and properties mentioned, natural rubber and the several types of GR-S are filling most of the requirements where high temperatures and oil resistance are not factors. Natural rubber is filling adequately the requirements of engine mountings, functional bumpers, and other parts where high resilience is required. The various types of GR-S, including the oil-extended types, non-staining and low water absorption types, are satisfactory for bumpers, seals, pads, gaskets, and many other parts. In many instances the choice of natural rubber or GR-S depends

on: (1) the particular properties required; (2) the manufacturing operations involved, and (3) the economic factors. It is reasonable to expect that the development of additional or improved types of GR-S could expand its use for many items now made with natural rubber.

Future Requirements of Rubber

As stated in the beginning, the future requirements for rubber involve more severe conditions of heat and cold, weather and ozone resistance, fluid resistance and requirements for colored parts.

High Temperature: The high temperatures referred to are in the 300° to 700°F. range. At present, 250°F. is considered as the high limit for a reasonable service life for either natural rubber or GR-S. While natural rubber compounds in general give higher tensile and elongation at elevated temperatures, GR-S type compounds tend to age better. They do not show reversion on prolonged heating. It should also be pointed out that tensile is not usually an engineering function and therefore other properties must be considered. For most high temperature applications the other synthetic elastomers must be considered.

Low Temperature Resistance: For automotive applications the low temperature characteristics have been evaluated almost exclusively by the low temperature brittleness test, ASTM D-736, and, more recently, ASTM D-746. Other tests such as low temperature stiffness, hardness, and compression set have been developed and are part of some military specifications. Tests should be selected which give emphasis to the property that is most important from a service standpoint. With the exception of the silicones, natural rubber and GR-S are most suitable for low temperature applications where oil resistance is not a factor.

In general, GR-S type rubber is considered to be slightly inferior to natural rubber when evaluated at low temperature by any of the above tests. However, the time of exposure at the low temperature may be a factor. A report from the Mare Island Naval Shipyard on exposure tests in the Arctic indicated that certain GR-S compounds might not increase in hardness as much as natural rubber compounds on prolonged exposure at —20° and —40°F. although the difference is not too great, possibly five points durometer.

The measure of stiffness at low temperatures as determined by Young's Modulus indicates a limit of serviceability of natural rubber close to —30°F. and —65°F. for GR-S. In the latter case, the selection of a low styrene GR-S and the use of low temperature plasticizers are required. For many applications including door and weather seals both natural rubber and GR-S types, particularly the low styrene types, properly compounded should be satisfactory for low temperatures of —40°F. and even —65°F. By properly designing the parts, the shrinkage or stiffening need not cause the part to fail in its function.

Weather and Ozone Resistance: It is generally accepted that GR-S type compounds are more susceptible to ozone damage than are natural rubber compounds. However, waxes seem to impart more protection to GR-S compounds for static exposures. In general, therefore, for static applications, such as window seals, properly compounded GR-S has greater weathering resistance than natural rubber. By proper compounding we refer to the use of high quantities of wax plus the use of good antioxidants. It has also been determined that careful and uniform mixing of the compound is required. On the other hand, the use of wax can be detrimental to ozone resistance in the case of flexing.

Recent developments have brought forth a group of chemicals now called antiozonants. They include a number of phenylene diamines, trimethyl-quinolines and nickel dibutyl dithiocarbamate. They are outstanding in the ozone protection which they impart to both natural rubber and GR-S type compounds. However, with the exception of nickel dibutyl dithiocarbamate, they impart staining characteristics to the rubber. In many applications this does not matter, but for window seals, lamp pads, etc., this is detrimental. We are still looking to the chemical industry for good non-staining antiozonants.

Colored Parts: In most instances colored rubber compounds fade or become dull due to chalking with age and exposure to the weather. This of course is undesirable. A lot of work has been done with colored coatings on natural rubber and GR-S. Here the problem is one of permanence of adhesion and permanence of color. All types of coatings including vinyl and Hypalon have been tried. Colored lacquers give good initial adhesion but tend to loosen with age. The most promising possibilities at present are vinyl lacquers or Hypalon on either natural rubber or GR-S. The other speakers will discuss neoprene and Butyl for this application.

Softer Sponge Rubber Parts: Reference has also been made to softer sponge rubber weatherstrips for doors and deck lids. At present most of these are made with natural rubber, GR-S or blends. The sponge is made in three compressions, 1, 3½ and 7 psi per 25% deflection. Since they must be water and weather resistant they are made with thin applied skin of either a 50 or 60 durometer stock of 1500 psi tensile. This skin is usually made integral with the sponge. The use of sponge rubber permits greater dimensional tolerances on the door and trunk lid stampings than would be the case with solid weatherstrips. Some people feel that even greater tolerances could be allowed if the sponge were softer and still provide doors with a minimum closing effort and with a weather and watertight seal.

Certainly, natural rubber and GR-S are suitable for this application, as are Butyl and neoprene. The limitation on the softness is controlled by the design of the part, the compression of the sponge and the hardness or modulus of the skin. Foamed latex, which can be made in softer compression ranges than chemically blown sponge, is being made into door seals by coating with Hypalon. This may be the answer for the requirements for softer seals. Here again design and economic factors must be considered.

Promise of Better Polymers

In conclusion, therefore, it is safe to say that both natural rubber and GR-S type rubber will continue to supply the bulk of the rubber requirements for many years. Research work on the part of the natural rubber suppliers will lead to better physical characteristics, higher yields and more uniformity. The producers of GR-S type rubbers will give us improved properties and thereby open up new fields of application and overcome some of the present weaknesses. The resistance of natural rubber and GR-S type compounds to atomic radiation is a property that requires much more study. The possibility of vulcanization by atomic radiation may introduce new or improved properties. Perhaps natural rubber and GR-S type compounds in the future will function in applications where they are now limited.

Oil-Resistant Rubbers Meet the Challenge

By B. M. G. ZWICKER

B. F. Goodrich Chemical Co., Cleveland, Ohio

THREE primary challenges for oil-resistant rubbers have been presented by previous speakers. These are: (1) Improve resistance to new types of oils and hydraulic fluids; (2) Maintain flexibility at lower temperatures; (3) Improve resistance to high temperature aging. It has been said that hindsight vision is usually 20-20, so let us first look at each of these challenges from the viewpoint of our past experiences.

Background of the Nitriles

During the early 1940's, two types of nitrile rubbers were available. One had good oil resistance similar to that of the original German Perbunan; the other was developed to meet more high oil-resistant needs for automotive and aeronautical engineering. At the beginning of World War II, most lubricating oils and gasolines were paraffinic petroleum types with only moderate percentages of aromatics. Low temperature requirements rarely exceeded a brittleness of —40°F. and high temperature performance in the range of 225° to 250°F. was considered adequate. The nitrile rubbers could be compounded with the relatively few softeners then available to meet these general requirements with relatively little difficulty.

Oil Resistance: These early conditions did not long endure. Many will vividly recall the crisis in fuel cells when our planes tried to use Indonesian aromatic gasoline. The trend has continually been towards higher speeds, more powerful engines, higher operating temperatures and automatic controls. These in turn have led to high octane fuels, high temperature lubricants and specialized hydraulic fluids. With these developments, improvements had to be made in the resistant rubber compounds. Both rubber compounder and polymer manufacturer have made significant contributions to improvements in all three critical properties.

The polymer manufacturer developed rubbers with higher percentage acrylonitrile to meet the demand for greater resistance to volume change in low aniline point oils. Polyacrylate rubbers were found to meet the need for a rubber material that would not become brittle after prolonged aging at 300 to 350°F. in the sulfur-bearing, extreme pressure-type lubricants and hydraulic fluids. In passing, it should be mentioned that Butyl rubber has been used for some of the highly polar ester type fluids.

Compounders made critical selections of new compounding ingredients and construction techniques. Due to the greater number of properties now being specified, this selection continues to be more exacting and usually requires compromises in other properties in order to obtain desired swell and shrinkage properties. Laminates often solved these problems better than single constructions. The automotive and aeronautical engineers also helped by modifying their design and selection of compromise lubricants to minimize demands on performance of the rubber parts.

Low Temperature Flexibility: This problem received increased attention in the late 1940's and early 1950's. Operation of military vehicles in Arctic regions, together with higher ceilings for aircraft, has demanded performance of oil-resistant rubbers at temperatures approaching —100°F. To meet this challenge, two approaches have been used:

(1) New ester type low temperature plasticizers were developed for the compounder. While better low temperature flexibility is obtained with these materials, it has been at the cost of increased shrinkage of the rubber part due to extraction of plasticizer by the oil. High temperature resistance is also impaired due to loss of plasticizer by volatilization.

(2) Lower acrylonitrile polymers were developed at some sacrifice in tensile properties. However, a more serious difficulty is that oil resistance varies directly with acrylonitrile content while low temperature flexibility is inversely proportional to the percent acrylonitrile in the rubber. This again calls for a compromise.

Compounders have often found that the best method of meeting present specifications has been by proper combination of both methods and designing to a performance standard for the specific part. Thinner cross-sections also minimize the stiffening of the polymer at the lower temperatures and thus make more durable parts. The machine design has also been modified to allow for warm-ups prior to operation or directly-heated components.

High Temperature Resistance: This is the most recent serious challenge for oil-resistant rubber components. With commercially available materials the compounder has already made significant contributions. Low sulfur and sulfur-free vulcanization systems impart improved heat resistance. More recently, peroxide-type cures have been found to impart both improved heat resistance and better low temperature flexibility than do the more conventional curing systems. The use of up to five parts of a low volatility antioxidant in a compound also gives slight improvement in resistance to heat deterioration, although the last word in high temperature plasticizers has yet to be written. In addition, some of the polymeric materials are helpful where low temperature flexibility is not a critical problem.

With the advent of polyacrylate-type rubbers, the effective operating temperature was raised approximately 100°F. above that of the best nitrile rubber compound then available. Oil resistance is equivalent to that of a medium acrylonitrile rubber and resistance to sulfur and chlorinated compounds is excellent. Unfortunately, low temperature properties of the polyacrylates do not approach those of nitrile rubbers, although with proper design they have performed adequately under average driving conditions in the United States.

Compromise Brings Results

To summarize the above, we see that the polymer manufacturer, the rubber compounder and the design engineer have, through compromise, been able to provide consumers with reasonably serviceable products during the past fifteen years. With some exceptions, we believe we can provide rubber parts that are serviceable from —50°F. with nitrile and polyacrylic rubbers for hydrocarbon oil-resistant applications.

Future Compounding Objectives

Our opinion that the trend towards expansion of the effective operating range at both ends of the temperature scale and exposure to new types of fluids will continue at an accelerating rate has been confirmed. It would help us to know what these new fluids are likely to be well in advance of their commitment to design. Closer cooperation between the design engineer, the rubber compounder and the polymer manufacturer might keep us better balanced in our work.

Future improvements through compounding are likely to be less productive than those of the past, at least with existing polymers. One obvious need is for a good, low temperature plasticizer which would not volatilize when exposed to elevated temperatures. Greater improvements will probably come through modification of present polymers or by development of entirely new polymers. Restricting these comments to nitrile and polyacrylic rubbers, the recently announced carboxylic rubber is a step in this direction. With this product, a high degree of oil resistance is maintained, while the brittleness temperature is extended to −90°F. However, it should be noted that although brittleness has been markedly improved, low temperature flexibility is only equivalent to that of a normal nitrile rubber of comparable oil resistance.

One of the previous speakers also made reference to the need for a lower friction oil seal rubber and to more oil-resistant latex dipped goods. Let us look at these two requests.

There are compounds based on graphite, cork, and cotton flock that have been recommended for nitrile rubbers to reduce friction. Further reduction of friction can be achieved by increasing modulus and hardness. The new carboxylic rubbers should be seriously considered because of their unusual hardness-elongation relationship.

In the field of nitrile rubber latices, substantial progress is being made towards a good material for dipped goods. In fact, the new carboxylic latices look especially promising with recent compounding techniques and latex dipped goods manufacturers should soon be able to offer parts with excellent oil resistance.

Polymers from higher acrylates have long been studied for improved low temperature flexibility, but with retention of the excellent high temperature properties typical of commercial polyacrylate rubber. Progress in this direction may seem disappointing to consumers, but we want to make a substantial improvement rather than to offer a series of marginally better products. While it is true that there is no progress without change, change in the specialty rubber parts business is also expensive.

Thus, we must conclude that there is no revolution in sight that will solve these problems overnight. Extensive, specialized compounding studies may develop an excellent rubber product for a specific application. However, experience dictates that we must always end our struggle in a compromise.

For example, which do we need most—good heat resistance or aromatic or diester oil resistance? Which is more critical—low temperature flexibility or high temperature resistance? It is our continued research objective to develop and improve oil-resistant rubbers by expanding their applicability over a wider temperature range while maintaining or improving oil resistance. In the foreseeable future we expect to achieve materials with adequate performance over a temperature range of −100° to +400°F. by better compounding and with improved nitrile and polyacrylate rubbers. We cannot visualize operations at 500°F. and above with these types of polymers.

Our prediction on temperature range is not for ASTM laboratory tests, but rather for field performance. For example, polyacrylate fails at −10°F. on the laboratory brittleness tests. However, in actual service, certain types of seals have given satisfactory performance at start-up and continuous operation in oil at −40°F. Therefore, to meet these challenges most effectively, we believe the burden should be shared equally by machine designers, rubber parts manufacturers and polymer manufacturers.

Success or failure of a part is often a matter of a few degrees of temperature or a few percentage points higher aromatic content in the oil. If the machine designer and the compounder work closely to engineer satisfactory performance with existing rubbers for today's needs and write tomorrow's needs well in advance, the polymer manufacturer may be able to have the superior rubber available for tomorrow's advanced design. It takes time and money to develop a new specialty rubber, but it takes much more time and money to get it written into the specifications. The larger the jumps, the less the wasted effort and the more value the ultimate consumer will receive for his money.

Butyl Rubber in the Automotive and Aircraft Industries

By H. G. EVANS

Enjay Co., Inc., Akron, Ohio

THE aircraft industry stresses an interest in higher heat resistance, usually in combination with lubricant and fuel resistance. Temperatures above 400°F. are too destructive to Butyl for continuous service; however, where a marginal improvement is desirable, Butyl should be examined, as it is superior to many of the other well known rubber polymers.

When aircraft parts are required to withstand hydrocarbon lubricants and fuels, Butyl cannot be recommended but Butyl is highly resistant to oxygenated hydrocarbons. For example, Butyl is recommended for its resistance to the phosphate esters commonly used in aircraft hydraulic fluids. As similar oxygenated compounds for lubricants and fuels are developed, Butyl should certainly be considered.

Oxidizing agents for propellants require corrosion-resistant rubber parts. Butyl is well known for its acid resistance and Butyl or its homologue, Vistanex, should be investigated for this service. Aircraft rubber parts are subject to ozone attack. Where this problem is not combined with mineral oil resistance, we recommend Butyl.

We are more receptive to the challenges of the automobile industry. By choosing our ground we can become aggressive. Without reservations we recommend Butyl as the answer to the following challenges: (1)

Tires with longer service life; (2) Weather-resistant rubber parts; (3) Colored rubber parts; (4) Soft sponge weatherstripping, and (5) Safety padding. While discussing the properties of Butyl that answer these challenges, we would like to list some other properties of the polymer that might well be utilized to improve the rubber parts on today's automobiles.

Butyl has excellent weather resistance. For example, a colored Butyl molded part has retained over 80 percent of its tensile and elongation after 14½ years of test rack exposure. After nearly eight years of exposure to weather in Utah, the compound on a Butyl-coated fabric shows by test essentially no deterioration. Numerous other cases can be cited to show that not only black but weather-resistant, vivid colored parts, to match the styling, can be made from Butyl. Weather-aged samples show no sign of "alligatoring", chalking or fading.

Using the term "weather resistance" in its broadest sense, i.e., resistance to outdoor exposure, the following general recommendations can be made:

(1) Use Butyl grade having minimum unsaturation consistent with limitations of product or process.
(2) Increase zinc oxide content to about 20 percent.
(3) Optimum cure.
(4) Use minimum loading consistent with economics and process requirements: (a) Furnace and thermal blacks are generally better than channel blacks; (b) Mineral fillers are generally better than blacks.
(5) Good dispersion is necessary.
(6) Minimize plasticizers—high viscosity mineral oil plasticizers are preferred.
(7) Coloring pigments vary in their effectiveness.
(8) Quinoid cure is normally better than sulfur cures (stain).
(9) Wax up to 10 phr can be used without excessive bloom.
(10) Freedom from contamination with other vulcanizable polymers (except brominated Butyl).

Butyl has already been selected for a number of services where its resistance to high temperatures can be used. Products such as Bag-O-Matic bladders, steam hose and hot material belts do not fit into the transportation industry, but they do indicate the degree of heat resistance inherent in Butyl.

One of the interesting characteristics of Butyl is its freedom from hardening during high temperature aging. In reinforced rubber parts, the fabric or yarn is protected by having a rubber that remains soft and flexible throughout its life. Compounding recommendations for this service are:

(1) Use Butyls of highest unsaturation.
(2) Superior products can be obtained by using quinoid-type cures.
(3) Use low sulfur and high acceleration ratios.
(4) Certain accelerators, such as tellurium diethyl dithiocarbamate or selenium diethyl dithiocarbamate, are superior to others.
(5) High state of cure.

If not better, Butyl has at least as good abrasion resistance as other general-purpose polymers. This property is best used in tires, black or colored. Unfortunately, standard wear tests are conducted over short time intervals where the effect of aging on wear cannot be evaluated. Average motorists who drive five to ten thousand miles a year, and who must usually replace tires at less than thirty thousand miles, should be able to show greatly increased mileage using Butyl tires. Other advantages of Butyl treads are freedom from noise during cornering, low noise level of mud and snow designs, and freedom from chipping and cut growth.

Recent tread development work indicates that minimum abrasive wear is obtained by designing the compound to be dynamically soft, at the same time maintaining high rupture resistance. In other words a soft, tough compound. Heat treatment will improve this property in present commercial grades of Butyl, although our tread development is directed toward the use of polymers of high molecular weight. Low concentrations of sulfur and accelerator serve to maintain dynamic softness, and channel blacks together with high viscosity mineral oil plasticizers are recommended.

The unusual dampening properties of Butyl is a characteristic that has wide application. It might be said that Butyl contains its own built-in shock absorber. In a search for a new means of improving riding comfort, this engineering property is being adapted in the suspension design. The dampening qualities of Butyl can be varied within limits by:

(1) Amount and type of reinforcing agents.
(2) Unsaturation and cure state.
(3) Plasticizers.
(4) Mode of cure.
(5) Mixing procedure, such as heat treatment.

When the important feature of riding comfort is discussed, again the use of Butyl in tires cannot be overlooked. Those who have ridden in cars equipped with Butyl tires will attest to the freedom from vibration or noise while driving over rough roads or cobblestone pavement. This dampening quality of Butyl is also observed in chemically blown sponge. Where dynamic softness is desirable, such as in safety padding and door weatherstripping, Butyl should be the answer. Good age resistance, low compression set and high tear resistance in colored parts has focused considerable attention on Butyl for sponge applications.

Resilient compounds can be produced where needed, but usually to the detriment of some other qualities. A dead, logy feel has always been indicative of low grade or undercured compounds, or poor compression set properties. This is decidedly not true with Butyl. Other outstanding properties of Butyl that find limited applications in the automotive and aircraft industries are its electrical properties and moisture and chemical resistance. Compared on the basis of performance, Butyl will give more years of satisfactory service for the same cost than other general-purpose polymers.

Bromine-modified Butyl (Hycar 2202) has essentially all of the desirable properties of Butyl with certain important additional advantages. It is faster curing and can be blended with GR-S and natural rubber, thereby imparting the desirable properties of Butyl to these polymers.

In discussing rubber and compounding costs we would like to inject a word of caution. This discussion has summarized the properties of Butyl as they enhance the performance of rubber parts. It is therefore by performance alone that the qualities of the Butyl parts should be measured. Care should be taken in using SAE-ASTM specifications for purchasing rubber parts made from Butyl. We refer specifically to the specification number defining tensile and hardness.

In Butyl compounds, the only property that is measured by a tensile test that cannot be measured better by other means is tensile strength. Where arbitrary high tensile requirements are demanded of rubber compounds made from Butyl, the rubber compounder is severely restricted in the design of the part and the purchaser will usually find that the purchase price is no longer competitive. May we suggest that the Butyl compound be designed for the service first and defined by the specification later.

Neoprene and Hypalon Meet the Challenge

By R. W. MALCOLMSON

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SEVERAL of the previous speakers have presented interesting challenges and this paper will present a few ideas on how neoprene and Hypalon can meet some of these challenges. Since relatively speaking, neoprene is a mature material, major improvements in this polymer in the next several years are probably less likely than they were during its early days. However, we can expect that improved neoprene polymers will be developed in the future, as in the past, to help solve some of the problems which have been discussed.

Realism of Cost Factors

The need for improvements in the ozone resistance of automotive rubber products has been mentioned. At the same time, the automotive industry must be very realistic about the prices which it pays for the thousands of components which go into a car. The two requirements of excellent ozone resistance and low cost can be met in many cases by the use of oil-extended neoprene compounds based on Neoprene Type WHV. In many SAE grade numbers, such stocks are competitive in cost with compounds made of lower-priced general-purpose synthetic rubbers. As a result, there is a definite trend in the automotive industry toward the adoption of more Type WHV stocks, particularly under the hood, to replace less satisfactory compounds based on other types of synthetic rubber. This idea of an oil-extended neoprene compound, then, represents one very practical approach to the ozone resistance requirements of the automotive industry.

In talking about Hypalon a little more background is warranted, because Hypalon is a much newer material and is probably less familiar than neoprene. Chemically, Hypalon is chlorosulfonated polyethylene. In terms of the problems which have been presented at this symposium the properties of Hypalon which are of the greatest interest are these: First, excellent resistance to ozone and weathering; in fact, Hypalon is for practical purposes ozone-proof. Second, ability to be produced in any color and with excellent color stability. Third, excellent resistance to dry heat. Fourth, nominal oil and solvent resistance.

With this highly desirable combination of properties, Hypalon provides answers to a number of automotive industry problems. For example, color-stable, weather-resistant rubber parts for such applications as weather-strip or sponge door strip. In fact, in the latter case, Hypalon coatings (in a black color) are already used by one of the major automotive companies to provide ozone and weather resistance. It is only a step from this point to colored coatings for the same application.

The need for improved convertible top materials has also been mentioned. One company has already adopted Hypalon-coated fabric for this use. Others are actively evaluating it in convertible tops. Hypalon is less temperature-sensitive than the currently used coatings and, based on all experience to date, Hypalon-coated fabrics are easier to clean than present constructions.

At the present time, Hypalon is produced in relatively small volume. Consequently, the cost is high compared with other elastomers. However, you may have read recently about the new Hypalon plant which is now under construction in Beaumont, Texas. With volume production and growing consumption, the trend in price will certainly be downward. This will accelerate the acceptance of this polymer for many automotive products where cost now rules it out. For the immediate future, however, Hypalon will still be a premium-priced elastomer. Therefore, we are doing a considerable amount of work on blends of Hypalon with other less expensive materials. Formulations have already been developed which have the weather resistance and color stability required for automotive purposes at substantially lower cost than could be obtained in all-Hypalon stocks.

Not only is Hypalon handled by normal rubber industry fabricating methods, such as molding, extrusion, calendering, etc., but it is also very well adapted to use in solution type coatings. This, too, represents an economical way to obtain both color and protection on automotive products. We feel that Hypalon coatings have some very definite advantages. The use of carbon black in the average rubber shop makes color control a difficult problem, particularly control as close as that demanded by the automotive industry. However, the use of a flexible coating on a neutral or black colored molded or extruded part is probably practical in many cases. This would certainly simplify color control substantially and, perhaps of equal importance, simplify the scheduling problem by having a single molding or extruding compound and several color coatings which could be applied later to make the finished product.

Marginal Improvements

The importance of marginal improvements as stepping stones to the final goal has been mentioned. I'd like to illustrate this with an example from automotive industry experience. For years neoprene has been the standard material for spark plug cover compounds. It has the resistance to heat, ozone and oil which is required. In the past few years, however, new engine designs have tended to place exhaust manifolds closer and closer to the spark plugs, making the heat resistance requirements extremely rigorous. In some cases, neoprene is no longer adequate. Solutions to the problem have varied. One manufacturer changed from neoprene to silicone rubber, a solution which cost them nearly fifty cents per car; another attached metal heat shields between the manifold and the plugs to reflect the radiant heat, so that neoprene could continue to be used. But this, too, meant additional cost.

Hypalon has all of the required properties for the job; in fact its top service temperature limit is about 35 to 40°F. above that of neoprene. So, one manufacturer took advantage of this in his new V-8 engine. Hypalon spark plug covers were used without heat shields to give the most economical solution to the problem. Another major producer is now on the verge of making the same change which will allow them to eliminate metal heat shields at an attractive saving.

One subject we haven't touched is the need for padding materials to satisfy the demands of the automotive industry for safety features in their cars. In this field,

the urethane foams seem ideally suited. Their foam-in-place characteristic makes it possible to produce parts of complex contour; for example, the padded instrument panels now in use. In addition, the range of properties which can be built into urethane foams by chemical means is almost limitless. Requirements have not yet been firmed up by the automotive industry on the deceleration and energy absorbing properties of safety padding. I am reasonably certain that urethane foam formulations can be developed to meet whatever requirements are ultimately agreed upon. Some very interesting and promising possibilities along this line have already been developed and are being evaluated.

By way of recapitulation, oil-extended neoprene compounds provide an economical solution to the need for improved ozone resistance where color is not required. Hypalon compounds have the ozone and weather resistance and the color stability needed for future requirements. The use of blends of Hypalon with other elastomers or the use of Hypalon coatings will help to minimize the price premium for such colored parts. And, in the safety padding field, urethane foams will certainly be a tremendous tool for the automotive industry to use in solving its problems in the future.

Questions and Answers

Question—Will L.T.P. replace hot GR-S completely during the next five years?

Answered by Mr. Allen: Probably not. There are many uses where compounds for adhesion, low water absorption, etc., require hot GR-S. In fact, hot GR-S is adequate in most uses where wear is not a factor. Possibly L.T.P. polymers with properties similar to GR-S will be produced in the future, but the need has not been stressed up to the present.

Question—Should the rubber industry have a substitute for styrene in times of benzene shortages? Should they support such a substitute with purchases, even in a time of relative plenty? For example—vinyltoluene.

Answered by Mr. Allen: A large number of substitutes for styrene have been tested. Many have proven to be satisfactory, among which are vinyl toluene, methyl styrene and methyl methacrylate. This problem is one of economics, since it may be more expensive to set up to manufacture a substitute than to expand the facilities for benzol production. We do not believe that they should be supported with purchases.

Answered by Mr. Evans: It is possible that benzene might get into a position of short supply and so restrain the amount of styrene. This does not appear to be an immediate problem. Although benzene is an important raw material for many growing uses besides styrene, it must be remembered that we are no longer dependent on coke ovens and tar distillers as the sole source of supply. There is, today, a sizeable installed capacity for producing chemical grade benzene from petroleum amounting to about one-third the total capacity of about 360 million gallons. Market requirements are not at this level as yet despite the heavy demand for styrene occasioned by the high GR-S output. In fact, it will probably be 1959 or 1960 before demand catches up to total capacity and, doubtless, before that comes to pass further expansion of petroleum benzene will have occurred. In other words, we already have an alternate source of styrene raw material in petroleum benzene.

Question—What improvements can be expected in oil-resistant polymers during the next few years in regard to heat resistance and solvent resistance?

Answered by Dr. Zwicker: I have already mentioned our prediction on heat resistance—up another 50°F. from present materials. However, solvent resistance is more difficult to answer in generalities. A recent article in the August, 1955, issue of *Rubber World*, by Major Hamlin of the U.S. Air Force, presents an excellent review of the problem and we agree that a fundamental change in polymer composition will be needed to meet the mutual requirements of new liquids at higher temperatures. Engineering around low temperature flexibility requirements and cooperative work by polymer manufacturers and engineers on the combination of solvent and polymer could result in substantial improvement in performance of rubber parts.

Question—Discuss nitrile rubber in synthetic oils as developed for new Government specifications.

Answered by Mr. Bartholomew: Compounding studies with nitrile rubber at WADC have shown that 275° to 300°F is the upper temperature limit for application in diester lubricants. All the compounds prepared from existing Buna-N polymers cracked (in laboratory tests) after as little as 24 hours at 290°F. in MIL-L-7808 engine oil. A new synthetic lubricant-resistant elastomer specification is soon to be released by WADC, one class of which will be devoted to nitrile rubbers. The tentative details of the class are:

Temperature range:	−65° to +275°F.
Test specimen:	"O"-ring—AN6227-19
Physical properties after aging 70 hrs. at 275°F. in Flexol 201 +½% phenothiazine (a commercial diester with antioxidant used as a standard test fluid):	
Tensile Strength:	900–1000 psi.
Elongation (without cracking):	130–150%.
Hardness (Shore A):	60–80.
Volume Changes:	+1 to +10%.
Compression Set:	70 hrs., 250°F. (in air), 35% max.
Temperature Retraction (TR-70):	−25°F.

Answered by Dr. Zwicker: I assume that this question refers to the new MIL-L-6085, 6387 and 7808 synthetic oils for use at 300 to 350°F. Because of their chemical nature, the polyacrylic rubbers withstand these materials better at high temperatures than the nitrile rubbers, although volume swell and tensile loss is substantial with both types. At lower temperatures and for short periods of time, nitrile rubbers are somewhat superior to the polyacrylics in resistance to these ester type oils. However, generalizations are difficult.

A given oil such as 6382 in contact with a high acrylonitrile content rubber compound at 300°F. or 350°F. swells it about as much as ASTM No. 3 aromatic oil. However, tensile and elongation loss is substantially greater with the synthetic oil. The 6085 oil is less severe on both swell and tensile loss, but elongation loss is substantial, even at 250°F. This may be due in part to selection of additives for the oil which attack the unsaturated rubber. Cooperative work with the oil compounder might improve this situation substantially.

Conversely, Turbo Oil No. 15 (7808) swells high acrylonitrile rubber compounds about the same as ASTM No. 3 at 350°F. and reduces elongation in about the same manner, but tensile loss is much more rapid with the synthetic. A different type of reaction is implied, but it may also be related to chemical additives in the oils rather than the nature of the oil itself.

Question—What temperatures and what oils, fuels, etc., can rubber be expected to resist in the future?

Answered by Mr. Simpson: It is difficult to predict the type of fluids that may be developed because they change so fast, and also because there are so many manufacturers of lubricants and fuels. However, the variety of additives seems to be growing and probably will continue to grow, including the general types given in the opening remarks. There is also a tendency for a larger aniline point range of lubricants which affect rubber swelling characteristics. The aromatic content of fuels seems to be rising as higher octane ratings are produced and this will require "rubbers" with greater solvent resistance. Cooperative efforts between the rubber industry and producers of fuels and lubricants, each considering the other's problems, would seem to be a very desirable means of achieving continued good sealing of all hydraulic units as changes occur. As stated earlier, 400°F. seems to be a maximum temperature to consider in the next few years. It should be pointed out, however, that seal materials should withstand fuels and lubricants at these temperatures in some air.

Answered by Mr. Bartholomew: Anticipated temperatures to be encountered by elastomers in contact with various aircraft fluids are as follows:

Fluid	Temperatures to be Encountered by Elastomers in Contact with Fluids
Engine Lubricants (diesters currently in use)	300°F. for continuous operation peaks of 400°F.
Diesters (experimental)	300–400°F. for continuous operation peaks of 450°F.
Pentaerythritol Esters (experimental)	350–400°F. for continuous operation peaks of 450°F.
High Aniline Point Mineral Oils (experimental)	350°F. for continuous operation peaks of 450°F.
Silicone Oils, Alkyl Silanes, Polynuclear Aromatics (all experimental)	500°F. for continuous operation peaks of 600–650°F. (have many deficiencies as lubricants which must be overcome)
Hydraulic Fluids:	
Petroleum Base (e.g., red oil, currently in use)	275°F. for continuous operation
High Aniline Point Mineral Oils (experimental)	400°F. for continuous operation peaks of possibly 700°F.
Silicone Oils, Alkyl Silanes, Polynuclear Aromatics	500°F. for continuous operation peaks of 700°F.
Fuels:	
Aromatics (reciprocating engine fuels, e.g., 70/30 isooctane/toluene which is the standard test fuel)	400°F. for continuous operation peaks of 550°F.
JP-4 and JP-5 jet fuels	400°F. for continuous operation peaks of 550°F.

Question—What is the current end-use pattern for Butyl rubber? What will be the major use of Butyl in transportation items?

Answered by Mr. Evans: The current end-use pattern for domestic sales of Butyl rubber for 1955 was estimated as follows:

Transport (tubes, valves, tire curing bags and bladders, experimental tires, etc.)	86.5%
Non-Transport	13.5%

A further breakdown of the non-transport items would be approximately as follows:

Mechanical Goods (hose, belts, etc.)	6.33%
Wire and Cable	3.40%
Cements and Adhesives	1.53%
Coated Fabrics	1.10%
Can Seals	0.40%
Sporting Goods (bladders, etc.)	0.50%
Miscellaneous	0.24%

The major use of Butyl rubber in transportation items will shift from inner tubes to tires during the transition period which we are now in.

Question—How does Butyl compare with other rubbers used in tires in price, physical properties and processing behavior?

Answered by Mr. Evans: The price of Butyl is equivalent or lower than the price of the GR-S type rubbers. Some physical properties of Butyl are quite different from those of GR-S. The tensile and modulus characteristics in tire type compounds will be of the same order of magnitude. The tear resistance is superior to the GR-S types and weather resistance is also better than GR-S. Rebound properties are not as good at room temperature as GR-S compounds but at temperatures above 70 or 80°C. the rebound properties of the Butyl compounds are equal to or better than similar GR-S compounds. Compounds produced from Butyl are easy to process and are equal to other rubbers being used in tire manufacture. The room temperature hysteresis properties of Butyl are not particularly good. However, at elevated temperatures, such as those that might be encountered in truck tire operation, the hysteresis properties of Butyl compounds are equivalent to or better than either natural rubber or GR-S.

Question—What polymer meets the following requirements: (1) Low permeability, (2) Compatibility with natural rubber and GR-S, (3) No deteriorating effect on fabrics.

Answered by Mr. Evans: Brominated Butyl has low permeability to air, actually equivalent to the excellent resistance of Butyl. It is also compatible with both natural rubber and GR-S. The long term effect of brominated Butyl on fabrics has not been determined.

Answered by Mr. Malcolmson: I think that the industry's general experience is that properly compounded neoprene will meet these requirements. Certainly it is acknowledged that neoprene has low permeability to most gases. In addition, blends of neoprene with natural rubber or GR-S are quite common. For example, white sidewalls made from blends of natural rubber and neoprene have been produced in large volume for quite a number of years. By the same token, there have probably been hun-

dreds of millions of pounds of neoprene used in fabric coating applications. Deterioration, generally speaking, is experienced only under extremely severe service conditions, notably high temperatures, and when the neoprene compound is not properly designed. The use of larger than normal amounts of antioxidants and zinc oxide are certainly compounding principles which should be employed to minimize chances of attack on fabrics.

Answered by Dr. Zwicker: Nitrile rubber approaches the requirements specified since it is compatible with GR-S, and to a limited extent with natural rubber, and has no deteriorating effect on fabrics. The resistance of nitrile rubber to gas diffusion is good. A high acrylonitrile content polymer, for example, was reported in the June, 1950, issue of the *Journal of Polymer Science* to have a permeability to hydrogen, nitrogen, and oxygen at 50°C. equal to that of Butyl.

Question—What are the prospects of developing rubbers that will not require textile reinforcements?

Answered by Dr. D'Ianni: There seems to be very little prospect of developing a polymer that will not require textile reinforcement in a tire. Tire fabric is an extremely important integral part of the tire and is required to produce stability in tire operations.

Question—What is the status of polyurethane rubber tires? Will urethane rubber treaded tires be available in 1960 for autos and trucks? What urethane rubber will be most suitable in treads? Is adipic acid-glycol ester-toluene diisocyanate urethane rubber the best compromise between cost and performance?

Answered by Mr. Malcolmson: Tire manufacturers are continuing tests of tires made with urethane rubber treads. In addition, manufacturers of urethane rubbers are certainly carrying on programs to improve the polymers which they have already released or described. It is quite probable that by 1960 tires with urethane rubber treads will be available for passenger cars. It is probably too early to tell whether experience with these new polymers will be far enough along for them to be used in truck treads by that time. In any case, it is probable that these tires will be in a premium price class and will be limited to the top quality constructions, at least initially. At this early date I am not sure that anyone has decided which of the many possible polyurethanes is going to be the best.

Answered by Dr. D'Ianni: Passenger tires containing polyurethane rubber treads have been extensively tested in the past year. Adhesion of the experimental tread to the carcass is still a problem, but not as serious as it was earlier. Tread wear ratings have continued to be substantially higher than with a GR-S or natural rubber tread. There is good reason to expect an improvement of 100 percent or more over conventional treads. It is anticipated that modifications in the raw polymer and in compounding techniques will make it possible to process a polyurethane tread stock through regular factory equipment and allow tires to be built in the conventional manner.

It is likely that by 1960 there will be limited production of tires containing a polyurethane tread for both autos and trucks. It cannot be definitely stated which urethane rubber will be the most useful for treads since experimental work on a number of different types is still in progress. In the long run, the polymer that has the best balance between processing properties, performance, and cost will be the most suitable. The polymer prepared from adipic acid, glycol ester, and tolyl diisocyanate seems to offer, at the present time, a good compromise between cost and performance. It should be pointed out, however, that there are other diisocyanates which, though somewhat more expensive, give better physical properties, so they may end up as equivalent to the system mentioned. Variations in the polyester portion of the polymer are also being studied, but again, it is too early to make any definite statement as to which would offer the best compromise between cost and performance.

Question—What is the future for isocyanate rubbers in the aircraft and auto industries?

Answered by Mr. Simpson: The isocyanate foam rubber products are finding use in automotive products fairly rapidly. Their use in parts requiring good energy absorption characteristics should increase rapidly if the price comes down with increased volume. Too little experience with solid polyurethane rubbers has been obtained yet to predict their possible application accurately. However, their properties (high strength, good abrasion resistance, etc.) are very interesting and they should be of value eventually when the rubber industry learns to process them and their cost comes down.

Answered by Mr. Bartholomew: Isocyanate rubber is very good for specific applications. It is easily foamed and is resistant to oils, chemicals, and ozone. The unusually high strength, elongation and resilience are, however, seriously affected by exposure to temperatures above 250°F. for prolonged periods. Its greatest use will probably be in the development of special personnel equipment, such as earphone pads, seat cushions, and pressure and exposure suits. Other potential uses include oxygen tubing, rain erosion resistant coatings, strippable protective coatings for parts and aircraft and other applications where the environment does not include ambient temperatures above 250°F.

Question—What further developments are anticipated for "synthetic natural rubber"?

Answered by Dr. D'Ianni: This question has been discussed by the panel, who agree it is too early to predict accurately further developments in the "synthetic natural rubber". There is no question that the synthesis of natural rubber is of great scientific importance, and a number of rubber and chemical companies are actively following up its development. Plans for pilot plant construction have been announced by at least one company. It is not felt, however, that rapid commercial development of this polymer will seriously affect the importance of our present general-purpose synthetic rubbers, such as cold and oil-extended cold rubber. These types have definitely established themselves on the basis of performance and cost.

The rapidity of the development of "synthetic na-

tural rubber" depends largely upon economic factors. Isoprene of high purity, required for this synthesis, is today commercially unavailable. The exact purity required, and the types of impurities which can be tolerated, still remain to be determined. To a large extent, we must depend upon the petroleum industry to supply us with the desired monomer at a reasonable cost. Isoprene will probably be somewhat more expensive than butadiene. The development of synthetic natural rubber will be largely influenced by the price and availability of natural rubber.

Question—What are the possibilities of a lower hysteresis polymer for passenger tires?

Answered by Mr. Allen: With the present methods of emulsion polymerization, the possibilities are quite limited. However, Goodrich, Goodyear and Firestone have announced new low hysteresis polymers. The problem now is to learn more about them, the raw materials and methods of manufacture.

Question—How far can synthetic polymers meet the requirements for tires capable of high sustained speed and/or loads? Considering the limitations of L.T.P. polymers, what are the possibilities of improved polymers to produce tires for modern passenger cars of high horsepower and speeds and turnpike operation?

Answered by Mr. Allen: The GR-S polymers available today are giving satisfactory service for today's requirements. Even though we have superhighways, current tires are adequate under today's driving conditions where legal speed limits exist and are reasonably enforced. Where speed limits are non-existent or not observed, speeds may range to 95 to 100 or 105 miles-per-hour. In these instances nylon tires are required. Obviously, continued research will bring forth new and improved polymers which may permit higher temperatures. The requirement of higher loads, higher speeds, etc., involves the entire tire and not the polymer alone. The design, construction, and fabric are also factors. These will require time. There is no immediate answer.

Answered by Mr. Evans: We feel that it is quite possible that tires can be produced from Butyl to operate on cars of high horsepower and high speeds. This will involve constructing a tire somewhat different from conventional tires but which would be possible because of the characteristics that Butyl compounds have. For example, tires can be produced using lower cord angle in the body since the flex resistance of these compounds is of such a magnitude that it can withstand the resulting higher strain in the base of the groove. Again, because of its inherent properties, a thinner sidewall and under-tread can be used which will give a tire of thinner cross section a resulting lower heat buildup. These same factors should be important in the building of truck tires capable of high sustained speeds and loads.

Question—How can natural rubber best be made to meet the challenge of higher speeds, heavier loads, and high temperatures in passenger tires?

Answered by Mr. Allen: In view of the many years of experience in compounding natural rubber in order to get the best properties possible, there is no outstanding improvement that can be made immediately. Natural rubber has certain limitations with reference to cracking, oxidation and aging. Blends with GR-S help to improve natural rubber with respect to these. New accelerators, antioxidants and carbon blacks, when and if developed, may make it possible to improve these properties in natural rubber.

Question—How can natural rubber best be made to meet the challenge of higher speeds and loads in heavy-duty truck tires? How much can we expect from present and new synthetic rubbers? Do wire cords offer any help?

Answered by Dr. Zwicker: The problems of compromise facing the oil-resistant mechanical rubber goods manufacturer in developing improved products are multiplied many times for the tire engineer. Any one who has seen high speed photographs of overloaded tires at speeds above 70 miles-per-hour realizes that problems of better tire construction for such service must include far more than just a better compound or a rubber or a cord. These are important, but so are tire design, construction, sizing and even vehicle construction. In fact, for the immediate future, better performance will probably have to depend primarily on engineering rather than new materials of construction.

However, with the recent discoveries of how to duplicate the natural rubber molecule, our defense planners can relax a bit. For tree rubber has been the material of choice over all other man-made rubbers for heavy-duty tires. High speed H.D. bus tire service tests on one of these new synthetics are reported to have gone through the first set of treads without failure and are now running on their first recaps. So far, wire cord for truck tires has apparently been inferior to nylon for rough road service. They are also more easily damaged by underinflation.

As to the future, we can be sure that competitive research towards a rubber that would be better than *cis*-polyisoprene will proceed at an increasing pace. We will simply have to encourage it and await results.

Question—Is the general public or the auto industry interested sufficiently in the 100,000 mile passenger tire to be willing to pay a premium price for it? How much premium would you estimate they would pay?

Answered by Mr. Simpson: This is a difficult question to answer. Cost depends so much upon competitive conditions. Certainly it would seem that a tire with 100,000 miles of life should be worth some premium if the public can realize its value.

Question—Are tires with wire cord more easily damaged by improper inflation and/or rough roads than nylon cord tires?

Answered by Dr. D'Ianni: Under conditions of improper inflation, wire cord is more easily damaged than nylon cord. When wire is excessively bent, it fatigues and breaks quickly, whereas nylon can undergo many more flexes before breaking. This can be very easily demonstrated by repeatedly banding a wire and a nylon cord and comparing their resistance to breaking. Under conditions of rough roads, underinflation becomes more critical.

Answered by Mr. Allen: To maintain the same deflection in service as fabric tires, wire tires are normally run at 10 pounds higher inflation. However, extensive testing of wire tires at the same inflation as fabric tires has failed to develop any weaknesses. I'm sure the same thing could not be said for nylon tires run at 10 pounds under the rated inflation.

As to improper overinflation, the wire tire would surpass nylon. For heavy overloads the increased inflation is a must and it is in such service that wire tires have been outstanding. The reason for this is that wire tires do not grow with increasing pressures and hence do not exhibit the undesirable overinflation wear characteristics found in nylon and rayon tires. On rough roads wire tires have better resistance to impact, break and cutting than nylon and again show better all around performance.

Question—What will be the effect on the size of the tire market over the next 10 years of the improved, more durable rubbers now being developed?

Answered by Dr. D'Ianni: Over the next ten years we confidently expect to see an increased and expanding market for both passenger and truck tires, primarily because the number of vehicles on the road will increase steadily. Tires will undoubtedly continue to become more durable, but the service demands will also constantly increase. The net effect will probably be one of an increased tire demand.

Question—What is the future for air cushions in passenger cars?

Answered by Mr. Allen: This cannot be answered by us as manufacturers. The consumer must answer this. It is not clear whether foamed latex seat cushions are included in this question. It is expected that this type of seating will continue to be used. Due to its load carrying characteristics and low permanent set, natural or GR-S latex blends will probably be used for some time.

Answered by Mr. Simpson: Air cushions are being presented by various manufacturers. Their application will depend greatly upon cost which now is somewhat high. They are now being used in some truck seat applications where we hear some claims by the manufacturer for reduction of driving fatigue on long trips.

Question—What non-tire items offer the most promise for additional use of elastomers in automobiles?

Answered by Mr. Simpson: Presently it appears that safety padding of many kinds will use considerable quantities of elastomers. Some manufacturers are using larger quantities of hose. As hydraulic units are added to vehicles, more seals will be needed.

Answered by Mr. Malcolmson: I think there are a number of possibilities for elastomers in non-tire use. Certainly, as power steering becomes more widely accepted, the market for power steering hose (already a rather substantial one) will increase. Expanded acceptance of air conditioning by the consumer public, especially as prices drop further, will increase the need for hose with low permeability to Freon refrigerants. Another application which is very interesting, and on which the automotive industry is expending a substantial amount of effort, is the replacement of the steel fuel line with an elastomeric hose or tubing. This alone would be a market for some 5,000,000 pounds of elastomer annually. In the future, the use of hose will probably expand as more automobile manufacturers find the need for a transmission oil cooling system of some type. Already several manufacturers are employing transmission oil coolers of one kind or another, most of them with at least a short length of hose in the system. The interest of the automotive industry in pneumatic suspensions also provides a field for elastomers in the future.

Question—What polymers have proven most successful in solving vibration problems in the automotive and aviation industries—particularly air springs?

Answered by Mr. Allen: Natural rubber, GR-S, neoprene and Butyl all find application depending on the requirements. For engine mountings and other functional parts, natural rubber is probably preferred, but GR-S, neoprene and Butyl are being used depending on the specifications for load-deflection, resilience, rate of damping, oil resistance, etc.

Question—What is the rubber industry doing about reported failures of airplane tires while taxiing long distances at 30 miles-per-hour?

Answered by Mr. Bartholomew: The Air Force has had no reports of failure of airplane tires while taxiing long distances at 30 miles-per-hour. Several laboratory tests were run at WADC on high ply rating B-47 tires in which they ran the tires for a distance of approximately three miles at 30 miles-per-hour and immediately followed this with a simulated take-off cycle. There were no failures in this test and the tires were okay by WADC. However, it is the opinion of most observers that because of the high deflection of aircraft tires and subsequent heat buildup, that these tires should not be taxied regularly for more than three miles.

Question—Are aircraft tires available that will withstand 600°F. temperatures? If not, how soon?

Answered by Mr. Bartholomew: Assuming that the aircraft tires in question will be exposed to 600°F. for prolonged periods rather than very short times, the answer quite frankly would be "no." The Air Force has recently initiated several research programs to develop heat-resistant rubber compounds and until this time very little, if any, data was available on the properties of elastomers while at elevated temperatures. Through this effort and the concentrated effort of the rubber industry, it is hoped that a good high temperature elastomer may be forthcoming in the future.

Question—What types of polymers show most promise for such a tire?

Answered by Mr. Bartholomew: The polymers which show the most promise for a high temperature-resistant aircraft tire are silicone rubber, several acrylates, Kel-F elastomer, and possibly some Butyl compounds. The following polymers are placed in order with respect to the aging temperature at which 25 percent of the original tensile strength was lost after heat aging for eight hours:

Silicone	480°F.	Neoprene	325°F.
Hypalon	350°F.	Polyurethane	280°F.
Poly FBA	345°F.	L.T.P.	275°F.
Nitrile	340°F.	Natural Rubber	210°F.
Butyl	335°F.	Vyram	Embrittled

The following polymers are placed in order with respect to the aging temperature at which 50 percent of the room temperature tensile strength was retained:

Butyl	330°F.	L.T.P.	197°F.
Silicone	323°F.	Nitrile	170°F.
Natural	277°F.	Hypalon	163°F.
Polyacrylic	277°F.	Neoprene	142°F.
Polyurethane	222°F.		

Question—Will design (construction), compounding or polymer be the best or quickest solution to this problem?

Answered by Mr. Bartholomew: The solution to this problem will undoubtedly require a combination of design, compounding and polymer research.

Question—What are the possibilities of developing tread compounds with good abrasion resistance that will not develop groove cracks when flexed under tension?

Answered by Mr. Evans: By using Butyl in developing tread compounds the possibilities are excellent that good abrasion resistance can be realized at the same time extremely good flex resistance is obtained. This means that a tread produced from Butyl will not develop groove cracks while being flexed.

Answered by Mr. Malcolmson: This problem, of course, is particularly bad in truck tires with nylon carcasses. Not only is there a good "possibility" of a solution, we feel that a solution is at hand. It lies in three-elastomer blends of neoprene, natural rubber and GR-S. To illustrate the improvement obtained with this type of compound I would like to summarize the results of just one of a number of road tests which we have run.

This test involved 16 tires in the 11:00 x 22 size with nylon carcasses. The tires were treaded with half-and-half treads, one half being the experimental three-elastomer tread and the other half being made with a regular production natural rubber tread compound with HAF black. After 60,000 miles, the cracks in the tread grooves were measured. Of the natural rubber half treads, only one had less than 60 inches of groove cracks. That one had 41 inches. The average for all of the 16 tires was 75 inches. The half treads made from the three-elastomer compound showed a maximum of 1.5 inches of cracking and the majority of the treads showed no cracking at all. The average for this group, for practical purposes, was 0 inches of cracking.

One tire company has been producing truck treads from this three-elastomer blend since March, 1955. Practically all of the other tire companies have active test programs on such compounds.

Question—What is the present and projected relative status of blacks and non-black pigments as reinforcing agents in rubber products for transportation?

Answered by Mr. Evans: In Butyl rubber the future of non-black reinforcing agents is very good. Although insufficient data are available, it appears that the abrasion resistance of Butyl treads containing certain non-black reinforcing agents approaches that of conventional GR-S treads. Non-black reinforcing agents will also become more important as automobile styling requires more colored visible parts.

Question—Where does rubber go when it is worn off tires? Has anyone made a material balance on a wearing tire and identified the products as to solid, liquid, gas and chemical composition?

Answered by Dr. D'Ianni: To the best of our knowledge, no one has ever made a material balance on a tire during its service life and identified the products of decomposition.

There are two schools of thought concerning the abrasion of rubber. One believes that abrasion is primarily a mechanical process dependent on the physical properties of the stock. The other believes that chemical degradation plays an important role. Dr. Stiehler of the National Bureau of Standards, who has made a thorough study of abrasion, subscribes to the latter viewpoint, as far as normal treadwear on paved roads is concerned. On their tire tester they have found rubber particles at high rates of wear (treadlife 2000 to 3000 miles). They do not have good information for rates of wear usually found in service.

We have made some tests on rubber scrapings collected from highways. It was found that the percentage of rubber collected near curves far exceeded that on straightaway stretches. This correlates with our tests showing that the rate of wear on curved routes is much higher than that encountered on relatively straight and flat roads.

Question—Will vinyl plastic foams become a significant factor in comfort and impact automotive cushioning?

Answered by Dr. Zwicker: Vinyl foam is already being used in transportation seating because of its low flammability. Recent semi-commercial developments have produced resilient vinyl foam at four pounds per cubic foot, and this is now the lowest cost of the three types of foam materials. However, each type has its advantages and disadvantages; thus, we expect uses for all foam materials will expand, including vinyls. The technical advantages of vinyl foams include heat sealability, wide range of firmness and resiliency (impact energy absorption), superior solvent, grease and chemical resistance, sunlight and moisture aging and color range.

Deficiencies at the present state of technology include higher compression set at 158°F. (excellent up to 125°F.), lower resilience at low temperatures, and heat cure rather than room temperature cure is necessary (although it is very rapid). Plasticizer migration has been minimized with recent developments. Load carrying and tear properties are intermediate between unaged rubber and polyurethane foams, but the excellent aging properties of vinyl foam give it the advantage in many applications.

An index to Volume 78 of RUBBER AGE will be found on Pages 183 to 186 of this issue. Extra copies are available on request.

Division of Rubber Chemistry, A. C. S., Meets in Cleveland on May 16-18, 1956

THE 69th Meeting of the Division of Rubber Chemistry of the American Chemical Society will be held at the Hotel Cleveland in Cleveland, Ohio, on May 16, 17 and 18. The meeting will feature the presentation of twenty-six papers, including an invited paper by Arnold H. Smith. Mr. Smith, as the first secretary of the Rubber Division, will speak on "The Rubber Division as I Remember It". As usual, the meeting will also feature a luncheon-meeting of the 25-Year Club, a business session, the divisional banquet, and a special ladies' program. There will also be nomination of officers for the 1957 season.

The technical program has been divided into four sessions, each with a general theme. The session on Wednesday afternoon, May 16, will be devoted to "New Polymers" and that on Thursday morning to "Degradation and Analysis." On Thursday afternoon the session will be on the subject of "Carbon Black". The final session on Friday morning will be on "Compounding" and some attention will be paid to miscellaneous subjects.

Shown above is a view of the Hotel Cleveland in Cleveland, Ohio, where the 69th meeting of the Division of Rubber Chemistry will be held.

Different Session Chairmen

Following a system established at the last few meetings, different chairmen will preside over each technical session. The Wednesday afternoon session will be presided over by Arthur E. Juve (Goodrich), Chairman of the Division, and the Thursday morning session will be under the direction of B. S. Garvey, Jr. (Sharples Chemicals), Vice-Chairman of the Division. Chairman of the session on Thursday afternoon will be D. C. Maddy (Harwick Standard), and at the final session on Friday morning, Cecil A. Smith (N. J. Zinc) will preside.

Besides serving as chairman of the session on Friday morning, Mr. Smith is also chairman of the Local Arrangements Committee. Earl B. Busenburg (Goodrich) is serving as vice-chairman. Chairmen of specific activities include: *Registration,* Harry Brubaker (Witco Chemical); *Meeting Room Arrangements,* W. Von Fisher (Case Institute); *Finance,* W. T. Hall (C. P. Hall); *Banquet,* Emil H. Krismann (DuPont), and *Housing,* W. D. Parrish (Goodrich Chemical). F. W. Stavely (Firestone) will preside at the luncheon-meeting of the 25-Year Club.

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY

Hotel Cleveland, Cleveland, Ohio
May 16-18, 1956

Wednesday Morning—May 16
9:00 A.M.—Registration.
12:05 P.M.—25-Year Club Luncheon.

Wednesday Afternoon—May 16
2:00 P.M.—Introductory Remarks by Arthur E. Juve (Goodrich), Division Chairman.
2:05 P.M.—Technical Papers.

Thursday Morning—May 17
9:00 A.M.—Technical Papers.

Thursday Afternoon—May 17
2:00 P.M.—Technical Papers.

Thursday Evening—May 17
7:00 P.M.—Divisional Banquet.

Friday Morning—May 18
9:00 A.M.—Technical Papers.

Award for Best Paper

As to other details connected with the meeting, arrangements have been made so that proper recognition can be given to the author(s) of the best paper in the form of the "Best Paper Award". Attention has been called to the fact that nominations for the recipient of the Charles Goodyear Medal will also be considered at the Cleveland meeting. It is understood that an extensive ladies' program is being planned. It is also to be noted that the Local Arrangements Committee has arranged to handle early registrants from 4:00 to 6:00 P.M. on May 15 at the Hotel Cleveland, as well as on the morning of May 16, for the convenience of all concerned.

Abstracts of the papers scheduled for presentation at the meeting together with their authors and company connections, follow:

ABSTRACTS OF PAPERS

Wednesday Afternoon—May 16

New Polymers

Arthur E. Juve, Presiding

2:00 P.M.—1—Introductory Remarks.

2:05 P.M.—2—Recent Advances in Isocyanate Chemistry. ***R. G. Arnold, J. A. Nelson and J. J. Verbanc (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.). (Paper will be presented by Mr. Arnold).***

Although certain aspects of isocyanate chemistry are more than a century old, rapid development of isocyanate technology has occurred only during the past decade. Impetus for this work resulted from the successful use of these compounds in the synthesis and modification of polymers.

Di- and poly-isocyanates are of commercial interest because of their versatile reactivity. However, because of their extreme sensitivity to catalysis by acids and bases, reaction kinetics are complicated and their primary reactions with alcohols, amines and water are often accompanied by side reactions, many of which have not been recognized previously. Proper control of catalysis permits the rapid formation of high molecular weight polyurethanes and ureas. Further, the use of catalysts such as inorganic bases, tertiaryamines and phosphines allow the synthesis of such simple polymerization products as dimers and trimers.

Sensitive analytical techniques for the determination of isocyanate reaction products, such as biuret, allophanate, dimer, trimer, amine, etc., have been developed. These have proved useful in defining the detailed structure of certain complex polymer systems derived from isocyanates.

2:35 P.M.—3—Butadiene-2-Methyl-5-Vinylpyridine Copolymers for General Purpose Use. ***H. E. Railsback and C. C. Biard (Phillips Petroleum Co., Bartlesville, Okla.). (Paper will be presented by Mr. Railsback).***

Butadiene-vinylpyridine copolymers have long been recognized to give promising physical properties in conventional formulations. These copolymers are compatible with commercial processing oils and highly extended stocks exhibit good stress-strain properties and high resilience. However, because of the inherently poor scorch resistance exhibited by elastomers containing pyridyl groups, these copolymers have not been studied extensively as general purpose rubbers.

Compounding studies of butadiene-methylvinylpyridine (Philprene VP-15 and VP-25) copolymers have shown that acceptable processing safety can be achieved in compounds containing these elastomers. A combination of low sulfur level, a sulfur donor (dithio-dimorpholine) and a conventional accelerator gives scorch resistance comparable to that exhibited by butadiene-styrene rubber stocks. In the improved formulation these unique elastomers display high modulus, good low temperature properties and excellent laboratory abrasion resistance.

Butadiene-methylvinylpyridine rubbers respond to the normal reinforcement associated with HAF, ISAF and SAF type carbon blacks and are highly reinforced by mineral pigments in tread type formulations. The latter compounds are characterized by high modulus, excellent hysteresis properties and outstanding laboratory abrasion resistance.

Butadiene-methylvinylpyridine copolymers appear easily adapted to general purpose use and should offer significant advantages over conventional rubbers for certain types of service.

3:00 P.M.—4—Variations in Alfin Polymerization of Butadiene. ***Avery A. Morton (Massachusetts Institute of Technology, Boston, Mass.), and Bram B. Boonstra (Godfrey L. Cabot, Inc., Boston, Mass.). (Paper will be presented by Dr. Morton).***

Alfin polymerization is unique in that it occurs upon a solid surface. The character of the polymer is determined by the composition and physical condition of that surface. The salts used were the three simplest possible for an Alfin reagent, namely, allylsodium, sodium isopropoxide and sodium chloride. The variations studied were: (a) the proportions of sodium isopropoxide to allylsodium, (b) the difference between freshly prepared and aged reagents—a purely physical effect, and (c) the proportions of reagent to monomer. Polymerizations were carried out in a two-gallon autoclave and all at the same initial temperature (26°C.) and concentration of butadiene, 900 ml. per 6000 ml. pentane. The yield was a pound or over of polybutadiene in the better cases. The results are reproducible when the above variables are controlled.

The results show that the optimum yield is not obtained with large amounts of the most active ingredient, allylsodium, but rather at ratios of isopropoxide to allylsodium of 1.7 to 2.0. Changes which occur as each preparation ages are most interesting because they represent solely a physical change in the reagent. The yield increases rapidly during the first five days. Even with a very active catalyst this increase in yield will amount to 20%. With less active agents the increase will be 100% or more. Freshly prepared reagents, as a rule, cause a lower temperature rise per given yield of polymer. The reason is not clear at the moment, but a comparative freedom from accompanying side reactions may be indicated. For freshly prepared reagents the viscosity decreases with the amount of reagent.

The results in compounding work with oil extended Alfin polymers follow in general the changes in composition and age of the reagent. Alfin polymerization can be controlled and reproduced if attention is paid to the condition of the reagent as well as the temperature concentration and other factors used in polymerization.

(NOTE: This work was performed as a part of a research project sponsored by the National Science Foundation).

3:25 P.M.—5—Stability of Emulsion Polydienes. ***Maurice Morton and Michel Montu (University of Akron, Akron, Ohio). (Paper will be presented by Dr. Morton).***

A study has been carried out on the effect of polymer treatment on the solubility and intrinsic viscosity of emulsion polydienes. The polymers studied were polybutadiene, polyisoprene and polychloroprene.

The results showed that the treatment of the emulsion polymers had a very important bearing on their solubility and intrinsic viscosity. In general, polybutadiene is much less sensitive to treatment variables than either of the other two. However, the treatment conditions, e.g., temperature, presence of oxygen, shortstop, and antioxidant, are a very important factor as well. In addition, the type of polymerization recipe also enters into the question.

For polybutadiene and polychloroprene, it appears to be important to protect the polymer from cross-linking reactions, which lead to gel formation. This is especially important for the detection of any microgel which may be present in the original polymer. In the case of polyisoprene, on the other hand, it appears to be possible to obtain both cross-linking and oxidative degradation, depending upon conditions.

The importance of the above factors in the laboratory evaluation of emulsion polydienes is discussed.

3:50 P.M.—6—New Polymers from Natural Rubber. ***L. C. Bateman (The British Rubber Producers Research Association, Welwyn Garden City, Herts., England).***

Recent work at the B.R.P.R.A. on the preparation and characterization of graft and block copolymers of natural rubber with synthetic polymers is reviewed. In homogeneous solution or in latex, polyisoprenes can be combined with polymerizing monomers to form graft copolymers. On the basis of theory, experiments with low molecular polyisoprenes, and the general characteristics of the reactions with rubber, it would appear that interaction reflects chain transfer activity of the polyisoprenes —but there is one serious anomaly, viz, a peculiar specificity with respect to the initiating catalyst. The application of solvent fractionation and chemical degradation to the characterization of the interpolymers is outlined, and some interesting physical and technological properties are indicated.

The preparation of block copolymers from solid rubber follows as a natural consequence of the recent elucidation of the chemistry of mastication processes. The primary reaction under appropriate shearing conditions during mastication is the mechanical rupture of the rubber molecules into free radicals which then display the same reactivity as those generated in more conventional systems. Thus, they can initiate the polymerization of vinyl monomers, with polymer growth proceeding from the end of the initiating rubber radical. Such reactions can be readily realized provided certain not very stringent conditions are met, the most fundamental being (1) application of adequate shear to produce the primary radicals, and (2) the absence of free radical inhibitors, e.g., oxygen. This method of copolymer formation is of wide generality, both as regards the base polymer and the reactivty of the monomer and its chemical and physical nature.

4:20 P.M.—7—New Curing System for Silicone Rubber. *M. L. Dunham, D. L. Bailey and R. Y. Mixer (Silicones Div., Union Carbide and Carbon Co., New York, N. Y.). (Paper will be presented by Mr. Dunham).*

Improved performance of silicone elastomers has been obtained by a new curing system. Di-*tert*-alkyl peroxides have been employed as novel curing agents. The cure is obtained through pendant alkenyl and methyl groups by means of a peroxide-induced free radical mechanism. Vinyl and cyclohexenyl groups attached to silicon are among the alkenyl groups which have been studied. The cross-link is considered to be a trimethylene bridge in the case of the vinylsiloxy group. Blends of dimethyl silicone gums and vinyl-containing gums can be co-vulcanized. The concentration of vinyl groups has an extensive effect on the properties of the cured elastomers. Carbon black fillers are practical when the di-*tert*-alkyl peroxides are employed in the vinyl-containing gums. Black filled compounds exhibit very high electrical conductivity which is essentially unaffected by milling or processing procedures.

4:35 P.M.—8—Properties and Uses of a New Vinyl-Containing Silicone Rubber. *J. H. Lorenz and M. L. Dunham (Silicones Division, Union Carbide and Carbon Co., New York, N. Y.). (Paper will be presented by Mr. Lorenz).*

New low compression set values are obtained with vinyl-containing silicone rubber compounds without the use of additives. Other unique properties of these new materials include improved resistance to high pressure steam and improved solvent resistance. When cured with di-*tert*-butyl peroxide, thick sections of these compounds can be postcured immediately at 480°F. eliminating the stepwise procedure. Practical utilization of di-*tert*-butyl peroxide is achieved by a low volatility masterbatch. Properties of vinyl-containing silicone gums compounded with twelve different fillers are presented. Comparative data using four curing agents show the versatility of the compounds.

New or improved applications made possible by this rubber include thick section coatings for steel rolls for the textile, paper, printing, and plastics industries. Silicone rubber containing vinyl groups can now be used as gaskets on steam autoclaves, as oil seals in transmissions, and as brake cups. Electrically conductive stocks filled with carbon black may serve as wireless heating pads in de-icers, or as molding blankets; conductive silicone rubber components can serve to ground static electricity in many industrial aplications.

Thursday Morning—May 17

Degradation and Analysis

B. S. Garvey, Jr., Presiding

9:00 A.M.—9—Oxidation Rate Measurements: Effect of Compounding Variations of Hevea Rubber Vulcanizates. *A. G. Veith (B. F. Goodrich Research Center, Brecksville, Ohio).*

The oxidation of Hevea vulcanizates (with some minor exceptions) is described by a two parameter equation of the form:

$$r = r_o + k_a (O_2),$$

where r = instantaneous oxidation rate,
r_o = initial rate,
k_a = autocatalytic constant, and
(O_2) = amount of (O_2) consumed.

An equation of this form has been found by others to apply to the oxidation of simple olefins.

Correlation calculations show that both r_o and k_a are linearly related to the amount of organically bound sulfur. Variations in r_o and k_a are found among vulcanizates accelerated with various accelerators. The parameters r_o and k_a have different temperature coefficients and therefore represent rate limiting steps of different activation energy.

The effect of some inorganic fillers and carbon blacks on the oxidation behavior was determined. Under equal surface area conditions zinc oxide, calcium silicate and clay result in lower values of r_o and k_a than a control with no filler. Both furnace and channel blacks slightly decrease k_a while r_o is increased above that of the control. The increase of r_o varies linearly with the surface area of carbon black per gram of rubber as shown by correlation calculations. Values for k_a decrease slightly over this range.

9:25 A.M.—10—The Effect of Natural Gas Combustion Fumes on Latex Foam Products. *Donald M. Holkestad (Firestone Tire and Rubber Co., Akron, Ohio).*

Latex foam rubber compounds are designed to give maximum aging protection in service by the incorporation of suitable rubber antioxidants. Occasional cases of severe surface failure have been reported, however, after short periods of service. This investigation was concerned with the determination of the cause of failure and a study of means for its prevention.

This unusual surface failure was duplicated in the laboratory by exposing foam rubber to natural gas combustion fumes. Further work revealed that the nitrogen oxides, particularly nitrogen dioxide, present in small quantities in the fumes, were causing the failure. An accelerated aging test was developed to evaluate the relative protective abilities of various antioxidants and compounds. Some antioxidants which are considered to be very active by ordinary heat aging standards were not effective for nitrogen dioxide protection. Several antioxidants were found, however, which inhibited attack by the nitrogen oxides.

It was concluded that in the selection of antioxidants, the latex foam compounder must consider nitrogen oxide protection in addition to the usual requirements for protective agents.

9:45 A.M.—11—The Influence of Nitrogen Dioxide on the Aging of Foam Rubber. *H. L. Goebel and E. G. Bargmeyer (Footwear and General Products Division, U. S. Rubber Co., Mishawaka, Ind.) and P. D. Brass and J. U. Mann (General Laboratories, U. S. Rubber Co., Passaic, N. J.). (Paper will be presented by Mr. Goebel).*

In recent years it has been noticed that certain foam rubber articles, e.g., pillows, mattresses, and some furniture items, deteriorated very markedly in scattered areas throughout the country. This deterioration was not traceable to any of the normal aging factors. Work described in this paper indicates that the causative agent is nitrogen dioxide or related oxides of nitrogen, and that the deterioration of the foam is especially severe in places where homes or rooms are heated by unvented gas heaters. These oxides of nitrogen are also responsible for the discoloration of antioxidants or of rubber by antioxidants.

An apparatus in which gases resulting from the combustion of natural gas are circulated around foam rubber samples is described. This apparatus is believed to duplicate the conditions under which deterioration in service occurs rather closely. An apparatus in which samples of foam rubber may be exposed directly to measured concentrations of nitrogen oxide is also described. Test results obtained on this and the gas flue apparatus are discussed. The effect of a selected group of antioxidants and of some compounding ingredients on this type of aging is described.

Hevea, GR-S types, and acrylonitrile latex foam products have been studied, as well as vinyl plastisol and polyurethane foams.

10:10 A.M.—12—Determination of Ozone in Air. ***C. W. Wadelin (Research Laboratories, Goodyear Tire and Rubber Co., Akron, Ohio).***

The method of Crabtree and Kemp for the determination of ozone in air has been modified to eliminate the need for a correction factor for the volatility of iodine. The ozone from the sample is absorbed in a 2% potassium iodide solution which contains a measured excess of sodium thiosulfate. The excess thiosulfate is then back-titrated with 0.001 N potassium iodate to an amperometric end-point. The apparatus for detection of the end-point consists of a calomel electrode, a platinum electrode, and a sensitive galvanometer. No batteries or resistors are required. On triplicate analyses of eight samples ranging from 15 to 20 pphm, a standard deviation of 1.45 was found. By varying the concentrations of the solutions, samples containing from 2 to 10,000 pphm of ozone can be analyzed.

10:30 A.M.—13—Absorptiometric Microdetermination of Zinc Oxide in Rubber Products Using Sodium Diethyl Dithiocarbamate. ***K. E. Kress (Firestone Tire and Rubber Co., Akron, Ohio).***

An ultraviolet absorptiometric micro method for determination of zinc oxide has proved suitable in analysis for this important component in all types of rubber products.

A 1 to 5 mg. sample is either rapidly dry ashed at 550°C. or preferably wet ashed with perchloric acid. The acid soluble zinc is precipitated as the white zinc diethyl dithiocarbamate from weakly alkaline solution. The precipitate is extracted with ethyl ether and the measured absorbance in ether at 262μ or 285μ is used to calculate zinc oxide content of the sample. A turbidimetric modification has also been investigated.

This rapid micro method is very sensitive. Accuracy is believed to be superior to present titration methods for rubber product analysis. The method has been successfully applied to analysis for zinc in a wide variety of organic and inorganic materials used in rubber compounding. The rare interference of other elements forming colored carbamates (e.g., cobalt, nickel and copper) is easily detected and can be corrected for by an absorbance difference method.

10:50 A.M.—14—A Zinc Oxide Viscosity Test for Hevea Latex. ***H. G. Dawson (Research Laboratories, Firestone Tire and Rubber Co., Akron, Ohio).***

The chemical stability of Hevea latex usually means the stability to zinc oxide, since the ammonium salts of the water-soluble acids present in the latex serum react with zinc oxide in the presence of free ammonia and natural soaps to cause latex thickening during processing. By measuring the increase in viscosity with time (using a Brookfield viscosimeter), after treating latex with soap, a sensitizer, and zinc oxide, it is possible to measure the zinc oxide stability of the latex. The test requires only twenty minutes to run; it is sensitive and reproducible.

The zinc oxide viscosity (ZOV) test has been valuable in studying the effect of (1) aging Hevea latex at various temperatures, (2) ammonia concentration and preservative, and (3) variations in serum solids due to clonal differences or centrifugal purification upon the zinc oxide stability of latex. The test has been most valuable in predicting the processing behavior of Hevea latex in the production of foam rubber and other rubber products.

11:30 A.M.—15—The Rubber Division (1919-1927) as I Remember It. ***Arnold H. Smith, Webster Groves, Missouri.***

The author, who was the first secretary of the Rubber Division, A.C.S., and who continued in that office from 1919 to 1927, gives his reminiscences of the period. The difficulties of the initial formation are described as well as some of the efforts to organize alternate groups of rubber chemists. The conditions then prevailing in the industry and the contributions of various individuals, manufacturing companies and supply companies are discussed. The early growth of the Rubber Division and many of the turning points of those days are related by a member who was actively engaged in these affairs during the entire period.

Thursday Afternoon—May 17

Carbon Black

D. C. Maddy, Presiding

2:00 P.M.—16—Analysis of the Structure in Channel Black Dispersions. I—Stabilized Systems. ***Andries Voet (J. M. Huber Corp., Borger, Texas).***

It has long been known that particle size and surface area of a carbon black are of prime importance in determining its characteristics in dispersions. Increasing evidence has been brought forward to indicate that the tendency of the particles to adhere to one another and to form loosely bound aggregates (structures) is of great importance. Recently developed electrical methods have clarified our insight into the processes of particle interaction. The dielectric constant of a carbon black dispersion allows conclusions about the shape of the agglomerates, while the D.C. conductivity indicates the extent of formation of particle networks. This investigation presents a series of electrical measurements on dispersions of channel black in a mineral oil over wide ranges of concentrations, temperatures and rates of shear.

It has become abundantly clear that the elementary carbon particle is not moving freely in the dispersion, but a much larger irregularly shaped aggregate appears to be the kinetic unit, even at higher rates of shear. In systems in which the particles have been stabilized by an electrical charge as well as by steric protection, by means of an adsorbed film of polar material, the kinetic units associate to form larger association complexes. These are partly coiled at rest, uncoiled at low rates of shear and are destroyed at higher shear rates. The time required for the rebuilding of these complexes varies from a few seconds to several hours, dependent upon concentration and temperature. Higher temperatures and lower concentrations reduce particle interaction. In stabilized systems interlinked particle networks are not apparent.

2:20 P.M.—17—Analysis of the Structure in Channel Black Dispersions. II—Unstabilized Systems. ***Andries Voet (J. M. Huber Corp., Borger, Texas).***

Extensive electrical measurements indicate that in unstabilized systems the association tendencies of the primary carbon black aggregates are greatly increased, resulting in the formation of more extensive association complexes and an increased structural involvement. In addition, a process of reticulation, the formation in interlinked particle networks, becomes apparent. In dilute systems association clearly precedes reticulation, while in concentrated dispersions both processes run more or less simultaneously.

Application of low rates of shear will effectively destroy the reticulation, but the breaking-up of the association complexes of primary aggregates requires a much higher shear rate. The time required to cause structural changes is very short in sheared systems, but in quiescent dispersions the rebuilding of structures is a very slow process.

In unstabilized systems an increase in temperature strongly promotes both reticulation and association. Thus, extensive hysteresis phenomena are expected in quiescent dispersions, which were actually observed. Rheological data are misleading, since the measurement itself destroys the effect to be measured.

2:50 P.M.—18—The Reinforcement of Butyl Rubber with Carbon Black: Heat Treatment with FT Black. ***S. R. Shuart and A. M. Gessler (Enjay Laboratories, Linden, N. J.). (Paper will be presented by Mr. Shuart).***

Heat treatment of some Butyl rubber-carbon black masterbatches leads to significant improvements in chemical and physical properties of the resulting vulcanizates. Data on Butyl-FT black systems indicated that little response is obtained as a result of heat treatment. The most unusual effect of heat treatment observed to date is, however, the response obtained with Butyl-FT black systems containing plasticizer. Tensile strength, in-

stead of decreasing, is increased as plasticizer is added to the compound. The normal diluent effect of the plasticizer on breaking strength is thus reversed and the vulcanizate with twenty parts of plasticizer possesses a tensile strength double that of the vulcanizate without plasticizer. In addition, this vulcanizate has high elasticity and snap and in test exhibits dynamic properties equivalent to those of a first-line natural rubber inner tube.

Data are presented to support a postulated theory of this phenomena and the possible relationship between black and polymer. Physical properties, the effects of plasticizer concentration, and mixing techniques required to obtain the desired effects are discussed. Applications of this compound, along with possible variations for adaptation to other applications, are presented.

3:15 P.M.—19—The Chemistry of Reinforcement. II—Scorch in Natural Rubber Stocks Containing Carbon Black. *Merton L. Studebaker and Lester G. Nabors (Phillips Chemical Co., Akron, Ohio). (Paper will be presented by Mr. Studebaker).*

Hydrogen sulfide is probably always produced during vulcanization of rubber with sulfur, and its importance in vulcanization has been emphasized repeatedly. Craig et al [*J. Polymer Sci.*, Vol. 8, p. 321 (1952)] have suggested that the formation of hydrogen sulfide controls scorch, probably by reactions involving the accelerator and hydrogen sulfide which result in the liberation of sulfur atoms or radicals.

One function of zinc compounds is to buffer the hydrogen sulfide concentration. Carbon black also reacts with hydrogen sulfide and hence affects its concentration level in the compound. It might be expected, therefore, that the reactivity of carbon black with hydrogen sulfide would be one of the factors which affect scorchiness of loaded rubber stocks.

This reactivity is examined experimentally at vulcanizing temperatures and related to the properties of the carbon black. It is shown that the scorch data of MBT and Santocure accelerated natural rubber stocks loaded with various blacks can be correlated with (1) the amount of carbon black surface in the mixtures and (2) the oxygen content of the carbon black. This latter factor determines the reactivity of carbon black with hydrogen sulfide, probably because hydrogen sulfide adds to the quinoid structure which has previously been demonstrated to be present on the carbon black surface.

3:40 P.M.—20—Measurement of Dispersion in Black-Loaded Rubber. *C. H. Leigh-Dugmore (Dunlop Research Center, Birmingham, England).*

Reinforcement of rubber by finely divided fillers such as carbon black depends on their fineness; their reinforcing ability is not fully exploited unless individual particles are separated as much as possible, that is, unless they are completely dispersed.

Assessment of dispersion against this criterion (ultimate dispersion) can be made with the electron microscope but the technique is too unwieldly for regular use. It is sufficient for most purposes to know the gross dispersion or the proportion of the filler which is in the form of aggregates smaller than about six microns.

Gross dispersion is measured by examining sections two or three microns thick under the light microscope. Sections are cut with a sledge-type microtome having a freezing stage. The proportion of the field of view devoted to aggregates larger than about six microns is counted with the help of an eyepiece graticule divided in squares. This proportion is converted simply to an estimate of the proportion of the total filler in the stock which is dispersed as aggregates smaller than six microns.

The method has been found suitable for testing the efficacy of mixing processes and is simple enough for routine laboratory use. It has been found appropriate for rubber-like polymers and for polyethylene and has been shown reproducible in different laboratories.

4:05 P.M.—21—Effects of Mixing Time on the Properties Imparted to Rubber by Reinforcing Carbon Blacks. *I. Drogin (United Carbon Co., Inc., Charleston, West Virginia).*

The effects of mixing time on the properties of carbon black-reinforced butadiene-styrene rubber, butadiene-styrene oil-extended rubber, natural rubber, and Butyl rubber have been studied because the unprecedented increase in the use of new rubber the past few years has taxed mixing facilities and has put greater emphasis on faster processing in the rubber industry. This emphasis has led to shorter mixing cycles, higher rotor speeds, and high pressure or high horsepower mixing to attain the maximum production per unit.

This paper describes (1) the effects when the first stage mix or masterbatch is Banbury mixed for as short a time as 1½ minutes and as long as 12 minutes and (2) the effects of working the masterbatch on the sheet-off mill as long as 8 minutes immediately after its discharge from the Banbury.

Reducing the mixing cycle time of a masterbatch results in a lower temperature and in less power consumption. The final batch has higher viscosity, shorter scorch time, greater shrinkage, more nerve, thicker extruded gauge, duller appearance, roughness, lower modulus, higher elongation, lower resistance to abrasion, higher resistance to tear, lower heat build-up, practically no change in tensile strength, hardness, resiliency and flex (cut-growth), higher electrical conductivity and poorer dispersion.

Extended working of the masterbatch on the sheet-off mill, immediately after its discharge from the Banbury, scarcely improves the physical properties of the final batch, with the exception that its electrical conductivity decreases with longer milling. It appears futile to retain a masterbatch on the sheet-off mill for a longer period than is required for cooling and batching-off for later processing.

Provided there is sufficient air pressure on the ram and sufficient horsepower to properly operate the Banbury, and the plant facilities are properly designed for rapid feeding to the Banbury, and there is rapid incorporation of the ingredients, and handling the mixings most effectively, a Banbury mixing cycle time of two minutes for the masterbatch would not, for all practical purposes, detract materially from the physical properties of the final batch. A longer mixing cycle may be desirable from a processing angle, however, to reduce viscosity and thereby decrease nerve, shrinkage and swell, depending on the end use of the compound.

Friday Morning—May 18

Compounding and Miscellaneous

Cecil Smith, Presiding

9:00 A.M.—22—The Swelling of Nitrile Rubbers by Blends of Iso-Octane and Toluene. *Ross E. Morris and Paul T. Wagner (Mare Island Naval Shipyard, Vallejo, Calif.). (Paper will be presented by Mr. Morris).*

A 70/30 by volume blend of iso-octane and toluene is commonly used to evaluate the resistance of a rubber to gasoline. The swelling of the rubber caused by the solvent mixture is an important criterion of this resistance. The authors have investigated a feature of this swelling which has not been previously considered, namely, the relative distribution of the solvent components between the solvent phase and the rubber. Vulcanized gum nitrile rubbers of various acrylonitrile contents were used. Radioactive toluene was used to facilitate analysis of the absorbed solvents.

It was found that toluene is preferentially absorbed from the mixtures. The results obtained indicate by interpolation that if a rubber of about 39% acrylonitrile content were immersed in the 70/30 solvent blend, the volume ratio of iso-octane and toluene in the nitrile rubber at equilibrium would be 11/89. If a 50/50 solvent blend were used, practically no iso-octane would be absorbed; essentially all of the solvent in the swollen nitrile rubber would be toluene. The tendency for preferential absorption of toluene lessens as the acrylonitrile content of the rubber is decreased.

9:25 A.M.—23—Properties of a Carboxylic Nitrile Rubber (Hycar 1072). *C. H. Lufter and N. G. Duke (B. F. Goodrich Chemical Co., Avon Lake, Ohio). (Paper will be presented by Mr. Lufter).*

Carboxylic-bearing monomers have been combined with butadiene and acrylonitrile to give a nitrile rubber having unusual and seemingly useful characteristics. The unusual properties which result from the carboxylic polymer are primarily due to the reactions in which the polymer chain may be involved due to the active hydrogen of the carboxyl group. This paper discusses properties of the vulcanizates of the carboxylic nitrile rubber and makes direct comparison with a normal nitrile rubber counterpart.

The carboxylic rubber shows more versatility than normal nitrile with respect to methods of vulcanization. Excellent cures can be obtained by the use of bivalent metal oxides or salts alone. Certain properties, namely compression set, are improved by using a combination metal oxide-sulfur cure system. The mechanism of bivalent metal vulcanization is discussed briefly.

It is possible to use low volume loadings of carbon black to give compounds having greatly improved low temperature brittleness properties without the traditional sacrifice of oil resistance. Other properties exhibiting significant improvement over normal nitrile rubbers are abrasion resistance and hot elongation. Oil resistance of the carboxylic nitrile rubber is equal or superior to standard nitrile counterparts.

The presence of the carboxyl groups has altered the polymer in such a way that the physical characteristics of blends with vinyl resins and phenol-formaldehyde resins are changed from those normally obtained from blends of these resins with typical nitrile rubbers. Blends of the carboxylic nitrile with polyvinyl chloride produce stocks with greatly improved processibility. Vulcanization of the rubber portion of such blends also demonstrates some advantages for the carboxylic nitrile. Phenolic resins appear to be more compatible with the carboxylic nitrile rubber and produce highly reinforced blends.

9:45 A.M.—24—The Effect of Diester Lubricants on Elastomeric Materials. *Ralph M. Harper and J. Hartley Bowen, Jr. (Aeronautical Materials Laboratory, Naval Experiment Station, Philadelphia, Penna.). (Paper will be presented by Mr. Harper).*

During the past five years the use of diester lubricants in military aircraft has increased rapidly. This was necessary in order to extend the aircraft operating temperature range from —65°F. to +400°F. Nearly all high performance aircraft now require lubricants of this type in the form of oils or greases.

Elastomeric materials and articles are required in the form of hose, O-rings, gaskets, and other mechanical goods to contain these lubricants in aircraft systems. Data are presented showing the effect of di-2-ethyl hexyl sebacate and its homologues, and also commercial diester lubricants, on various elastomeric materials at temperatures ranging up to 350°F. At temperatures up to 300°F., nitrile rubbers based on polymers containing 30 percent or more acrylonitrile provide the most favorable diester resistance. Other oil-resistant polymers, such as low acrylonitrile content nitrile materials, neoprene and Thiokol, are unsuitable because of excessive swelling and/or deterioration. At temperatures above 300°F. polyacrylates or fluorinated acrylates provide favorable diester resistance, but are deficient in low temperature flexibility.

High temperature operation is the most serious concern at present. Unless new polymers having greatly improved high temperature diester resistance are developed, the engineers responsible for the design of future military aircraft, missiles, and extreme altitude vehicles will have their problems increased by the necessity of designing entirely new mechanical devices in which elastomeric materials are eliminated.

10:10 A.M.—25—Breakdown of Oil-Masterbatched GR-S Type Polymers with Various Antioxidants. *W. K. Taft, June Duke and Dorothy Prem (Government Laboratories, University of Akron, Akron, Ohio). (Paper will be presented by Miss Duke).*

Antioxidants of the staining and non-staining types were added to separate portions of a high Mooney viscosity GR-S-1500 type polymer (iron-pyrophosphate with rosin acid). Each series was coagulated without oil and with 37.5 parts of Circosol-2XH, Sundex 53 and Dutrex 20 per 100 parts of polymer, vacuum dried and aged at 140°F. to establish the parameters of breakdown.

Apparently the most stable polymers and masterbatches were obtained with beta-conidendrol, with respect to tendency to form gel, extent of polymer stability before breakdown, and rate and extent of breakdown. The non-staining antioxidants, in general, did not prevent gellation during heat aging but caused preliminary stability prior to breakdown which then proceeded at rather rapid rates. The non-staining antioxidant 2,2'-methylenebis (4-methyl-6-tertiarybutyl phenol) (Antioxidant 2246) gave practically no preliminary polymer stability but prevented gel formation, with the polymer being intermediate in rate of breakdown but not in the ultimate amount of breakdown. Polymers and masterbatches containing the staining antioxidants did not gel in most cases. These antioxidants caused the least preliminary polymer stability and the fastest rates of breakdown with, however, the exception of beta-conidendrol. Ditertiary butyl hydroquinone generally protected the polymer the least. The aforesaid generalities are more precise when applied to the results obtained with the base polymer and the Circosol-2XH masterbatches, and less precise but relatively the same when applied to the results obtained with Dutrex 20. The results of the Sundex 53 masterbatches maintained a position intermediate to those of the masterbatches made with the other two oils.

10:35 A.M.—26—Composition and Classification of Rubber Processing Oils. *S. S. Kurtz, Jr., J. S. Sweely, R. W. King and S. W. Ferris (Sun Oil Co., Marcus Hook, Penna.). (Paper will be presented by Dr. Kurtz).*

It is shown that the composition of rubber processing oils is related to specific gravity, viscosity and refractive index. With only these three easily determined pieces of experimental data the composition of rubber processing oils can be obtained in terms of % carbon atoms in aromatic rings, % of carbon atoms in naphthenic rings, and % of carbon atoms in paraffinic chains.

A study of such composition data shows that a relation between viscosity and gravity known as the "viscosity gravity constant" gives a good first approximation of the carbon type composition. The viscosity gravity constant is essentially independent of molecular weight. Viscosity itself is a function of molecular weight, so the use of viscosity and viscosity gravity constant provides a good simple system of classifying rubber processing oils.

The terms "paraffinic", "relatively paraffinic", "naphthenic", "relatively aromatic", "aromatic" and "very aromatic" are defined and given quantitative definition in terms of viscosity gravity constant and composition.

Processibility, volatility, low temperature properties, and degradation and oxidation effects are discussed in relation to the proposed classifications. Naphthenic and aromatic oils are superior to paraffinic in processibility. Paraffinic and naphthenic oils are superior to aromatic oils in low temperature properties. The lower the molecular weight of the oil the better the low temperature properties. Degradation and oxidation effects are greatest with aromatic oils and much less with naphthenic and paraffinic oils. A simple relation is shown between viscosity gravity constant of the extender oil and the degradation of oil-extended rubber.

Volatility is bad with oils of 300 molecular weight. With 400 molecular weight oil there is a little volatility, and at 450 it is negligible. A graph for getting molecular weight from viscosity at 210°F. and VGC is presented. The relation between aniline point and VGC is discussed. The amount of material removed by treatment with 85% sulfuric acid is an indication of the nonhydrocarbons and reactive aromatics present. The lower this value is the better as far as stability of the oil is concerned.

Lack of compatability, that is, the tendency to bloom out, is not a problem in the use of extender oils in styrene-butadiene type rubbers. In the case of Neoprene WHV and nitrile type rubbers, blooming out is a problem. In comparing processing oils for use in chloroprene and nitrile type rubbers, the % of saturated material, which can be separated by silica gel, is very important as well as the carbon type composition of both the saturated and aromatic fraction. The selection of oil for use in

chloroprene and nitrile type rubbers is a far more complicated problem than in the case of the styrene-butadiene type where blooming out is relatively unimportant.

11:05 A.M.—27—New Structural Compounds. ***Chas. L. Petze (Delaware Research and Development Corp., Wilmington, Del.).***

During the last several years, non-tire uses of rubber have grown in volume at a relatively higher rate, despite the marked increase in the production of motor vehicles. In large measure, these opportunities for the rubber industry have arisen from needs for new types of compound. In the words of Thomas Hancock, it is still the "elastic property (of rubber) that is so valuable". But we now are able better to preserve the toughness of rubber while obtaining values of flexural modulus, degrees of processibility and of machineability, levels of electrical and dielectric properties, and other characteristics that promise to make rubber products more attractive to more design engineers.

This paper will describe work done over the last six years to develop new compositions of matter, on which patent applications have been filed, employing silicones and other rubbers to obtain novel properties required for several severe service applications, especially in the growing electronics field. The property specifications, which largely rule out conventional compounding practices, will be summarized.

Data will be presented on attainment and maintenance of impact strength under continuous outdoor exposure, of high surface electrical resistance in the wet and dirty state, of low dielectric loss, together with information on dimensional stability under cyclic pressure and temperature conditions, on reduction of internal strain, and on processibility. Uses cited for these new materials will include 60-pound multi-band, omni-directional antenna radomes machined to complex contours, microwave antenna lenses for radio-relay links and communications networks, as well as for radar, end seal and strain insulators, some for installations in the Arctic, wire coatings for high temperature service, all of which depend in large part upon the stability and hydrophobic properties of these new compounds.

Fluorocarbon Base Inks for Hard-to-Mark Materials

THE problem of labelling, coding or otherwise marking the surfaces of materials that steadfastly resist conventional printing methods is nearing solution with new high temperature resistant, chemically resistant fluorocarbon type pigmented inks. According to the M. W. Kellogg Co., Jersey City, N. J., Kel-F printing inks adhere tenaciously to nylon, fluorocarbon and polyethylene surfaces and can also be used for marking a wide variety of rubbers and other plastics, including rigid and plasticized vinyls. Available as either fully compounded ink concentrates or as a clear vehicle and separate pigment suspensions, the new inks can be adjusted in viscosity, drying rate and color strength to meet individual requirements. This flexibility in formulation will permit fabricators to simplify inventories and cut costs by not having to maintain special ink stocks for each plastic.

The inks are of two types, air-drying and heat-setting. The air-drying series is obtainable presently in 11 different colors and shades, including black, blue, green, yellow, orange, white, red, violet, brown and grey as well as clear. The heat-setting series consists of only five colors currently: black, blue, green, red and silver. All shades fall within the limits set by MIL-Std.-104. For optimum adhesion, the Kel-F air-drying inks must be force-dried with hot air or radiant heat, according to the company.

The heat-setting inks, designed for applications where the inked impression must withstand solvent or chemical attack, can be cured in a hot air oven, with infra-red radiation, or by direct application of a hot iron. Setting times as low as one-half minute have been found practical while hot iron application has been conducted in only five seconds.

Coming Next Month...

"Application of Large A-C Motors to Rubber Mill Drives"—by C. E. Buchan, Electric Machinery Manufacturing Co., Minneapolis, Minn.

An analysis of the large power requirements special to milling and mixing rubber. (Note: This was delayed from the April issue).

"Temperature Studies of the Air in a Truck Tire"—by G. G. Richey, R. H. Hobbs, and R. D. Stiehler, National Bureau of Standards, Washington, D. C.

A discussion of several methods to determine the average air temperature in a truck tire.

"Autogenous Extrusion of Plastic Materials"—by A. N. Gray, Western Electric Co., Baltimore, Md.

Includes a discussion of a method for the accurate extrusion of plastic materials in which superfluous controls on conventional extruders are eliminated.

"The Properties of GR-S Type Rubber as Affected by Antioxidants"—by W. K. Taft, June Duke, Dorothy Prem, and T. B. Harrison, University of Akron, Government Laboratories, Akron, Ohio.

An evaluation of the various types of antioxidants as they affect polymers when heat-softened, milled or treated in a Banbury.

Plus several short practical articles.

The Measurement of Volume Resistivity of Plasticized Polyvinyl Chloride

By C. E. BALMER and R. F. CONYNE

Rohm & Haas Co., Washington Square, Philadelphia 5, Penna.

EARLY experience in the Rohm and Haas laboratories showed that the reproducibility of volume resistivity determinations on plasticized PVC under prescribed ASTM conditions of test was poor *(1)*. Furthermore, the correlation between volume resistivity values and insulation resistance values obtained on insulated wire was also very poor. As a result, the development of a DC resistivity testing procedure which would yield results of practical significance became an important objective in our work on the plasticization of PVC.

Two general approaches to the solution of the problem were considered. One was the installation of an extruder and accessory equipment in order to prepare samples of insulated wire for the determination of insulation resistance as is done commercially. The other approach was to attempt the development of a laboratory test procedure which would give good reproducibility of results and would correlate with insulation resistance results. Because the preparation of test samples of vinyl insulated wire promised to be expensive and to require undesirably large samples of compound, the latter approach was selected for initial study.

Related Factors

Several major factors which were felt to be related to the above-mentioned difficulties in obtaining reproducibility and correlation were as follows:

(1) Our laboratory measurements of volume resistivity were normally made at room temperature *(1)* whereas insulation resistance measurements were made at elevated temperatures in compliance with insulation specifications.

(2) The volume resistivity samples were tested dry whereas insulation resistance measurements were made while the samples were immersed in water *(2)*.

(3) Volume resistivity determinations were made on molded slabs having a heat history which was probably much milder than that of typical insulated wire samples.

(4) Insulated wire samples have a copper-vinyl interface which is not present in standard volume resistivity test samples.

In consideration of the above factors, it was apparent that we could choose test conditions which should minimize the influence of factors 1 and 2. If correction for these factors failed to yield significant results, factor 3 would be investigated separately along with the determination of the heat stabilizing properties of the plasticizer in question.

Through the courtesy of the Monsanto Chemical Company, we obtained information concerning the preparation of copper foil sandwiches for use as specimens for the determination of volume resistivity. This sandwich consists of a copper foil electrode which is molded between two previously molded slabs of plasticized vinyl, thereby providing a copper-vinyl interface and so permitting study of the influence of factor 4.

In summary, then, our immediate objectives were: (1) to explore the variables influencing the reproducibility of volume resistivity determinations, (2) to explore the effects of temperature and moisture on these results, and (3) to evaluate the use of a molded copper foil sandwich test specimen.

Development of Test Procedure

The initial portion of this study is based on the preparation and use of molded slabs of plasticized PVC as sample specimens. The following representative electrical formulation (by parts) was used in this study:

Geon 101	65.0
Plasticizer	35.0
Tribase	5.0
No. 33 Clay	15.0
Aristowax	0.3

Initial studies were based on three compounds differing only in that they contained different plasticizers. These plasticizers were selected for test because they had been used and studied extensively in commercial insulation compounds and shown to have electrical characteristics quite different from those observed in our laboratory studies. Resolution of this type of divergence of results was, therefore, a principal objective.

The ingredients, after hand mixing in a beaker, were charged to a two-roll Thropp mill at 325°F. and milled for five minutes after fluxing. The stocks were sheeted off at a thickness of approximately 90 mils. The samples were molded for 10 minutes at 175 lbs. steam pressure using the minimum pressure necessary to close the press. On completion of the heat cycle, the press is water cooled while applying 100 tons gage pressure to the ram. A four cavity ASTM rubber mold and a Williams White press were used in the molding procedure. The resulting specimens were 6 inches x 6 inches x approximately .075-inch.

The electrodes consisted of two 60 mm. diameter aluminum foil discs which were centered on and attached to both sides of the molded slab by means of a very thin layer of petrolatum. The use of a guard ring was omitted since the surface resistance was found to be 500 times that of the volume resistance using the above size electrodes and sample.

A Keithley vacuum tube electrometer, Model 200, along with a Keithley decade shunt and DC power supply were used for determining volume resistivity. Fig-

Note: This article is based on a paper presented by the authors at the Fourth Annual Wire and Cable Symposium, Asbury Park, N. J., December 6-8, 1955.

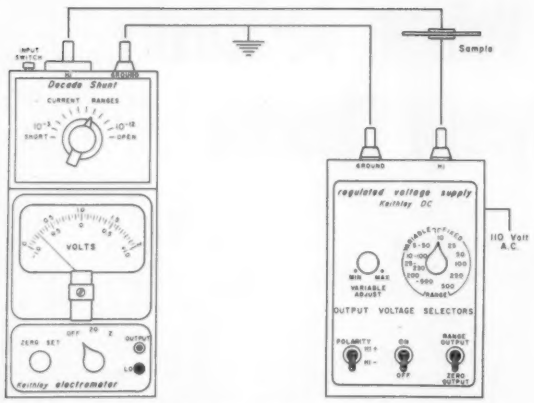


FIG. 1—Schematic diagram of equipment used for determining volume resistivity of plasticized PVC.

ure 1 shows the schematic diagram for setting up the required equipment.

In our early work we were dismayed to find that reproducibility was poor. Study of the causes of this poor reproducibility resulted in several refinements in our procedure. These refinements included: (a) the design and construction of a sample holder which would facilitate proper centering of electrodes; (b) the preparation of proper shields for the leads and sample holder, and (c) the adoption of a procedure for discharging samples prior to measurement. Figure 2 shows the improved sample holder. The procedure for discharging the sample consists, briefly, of grounding each electrode and observing by means of the electrometer the charge remaining on the sample. Discharging is continued until this remaining charge becomes negligible.

After conditioning the specimens for 24 hours, volume resistivity was first determined at 25°C. and 50% R.H. according to the following formula:

$$V.R. = R_v \frac{A}{t}$$

where V.R. = Volume Resistivity, in ohm-cms,
R_v = Volume Resistance, in ohms,
t = average thickness of the specimen, in cm., and
A = area of the electrode, in cm^2.

Representative results may be illustrated as follows:

VOLUME RESISTIVITY AT 25° C.
(ohm-cm × 10^{12})

Plasticizer	V.R.	Rank
A	600	1
B	450	2
C	140	3

The above results did not correlate with insulation resistance values (I.R.) obtained using the same plasticizers:

RANKING OF PLASTICIZERS
(Based on Insulation Resistance Results)

Plasticizer	I.R. (Megohms/1000 feet at 60°C.)	Rank
A	1.9	1
B	0.2	3
C	0.5	2

In initial studies of the effect of temperature on V.R. results, a test temperature of 60°C. was used. This was revised to 90°C. in later studies.

Samples were conditioned for one hour at the test temperature and measurements were made with the sample holder located in a circulating air oven at the prescribed temperature. Test results at 60° and 90°C. rank plasticizers in the same order as at room temperature. Representative 60°C. results may be illustrated as follows:

VOLUME RESISTIVITY AT 60° C.
(ohm-cm × 10^{12})

Plasticizer	V.R.	Rank
A	34	1
B	4	2
C	1	3

In order to determine the influence of moisture, the V.R. of test samples was measured before and after various periods of immersion in tap water at 60°C. Study of these results pointed to the desirability of adding another test condition to our test procedure. Under this condition, molded slabs were immersed in water at an elevated temperature for an extended period of time prior to the determination of volume resistivity. The aluminum foil electrodes could not be used under this test condition, due to release of the foil from the slab. The use of an aqueous dispersion of colloidal graphite was obviously unsuitable and consequently we adopted the use of conducting silver lacquer base paint (DuPont No. 4635) electrodes. These electrodes were the same size as original foil electrodes and were applied using a small brush.

The molded slabs were immersed for 20 hours in water at 60°C., removed from the water, blotted dry with cheesecloth to remove excess water, and dried for 15 minutes at 60°C., prior to measurement at 60°C. The following representative results were obtained:

VOLUME RESISTIVITY AT 60° C. "WET"
(ohm-cm × 10^{12})

Plasticizer	V.R.	Rank
A	6.0	1
B	0.2	3
C	0.8	2

These results yielded our first rank correlation with insulation resistance results.

In order to permit volume resistivity measurements while the test sample was immersed in water, we investigated the use of copper foil sandwiches as test specimens. The sandwich, as mentioned previously, consists of a copper foil electrode molded between two premolded slabs of vinyl. Figure 3 shows the configuration and dimensions of the electrode and the vinyl. One lead was attached to the protruding tongue of the foil. The sandwich was immersed in 2½ liters of tap water in a

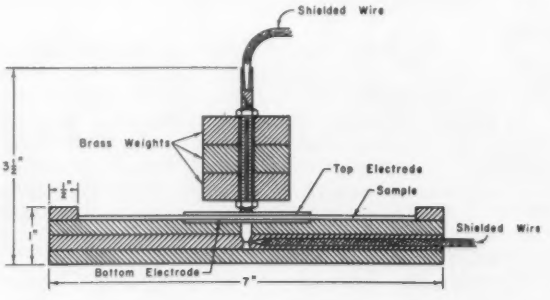


FIG. 2—Cross-sectional view of sample holder which facilitates proper centering of the electrodes.

TABLE I—COMPARISON OF VOLUME RESISTIVITY RESULTS OF MOLDED SLABS VERSUS COPPER SANDWICHES

(ohms-cms × 10^{12})

Plasticizer	Room Temperature				1 Hr. at 60°C.				20 Hrs. Immersion			
	Slabs	Rank	Sandwiches	Rank	Slabs	Rank	Sandwiches	Rank	Slabs	Rank	Sandwiches	Rank
D	256	1	1260.0	1	34.0	1	8.50	1	6.00	1	5.40	1
E	194	3	360.0	4	10.0	3	1.40	4	0.09	4	0.10	4
F	94	4	420.0	3	1.0	4	2.70	3	0.30	3	0.80	3
G	9	5	0.6	5	0.1	5	0.05	5	0.03	5	0.05	5
H	224	2	980.0	2	23.0	2	4.70	2	2.90	2	2.00	2

3 liter beaker to a level just above the 5 x 5-inch area. The other lead was attached to another copper foil electrode. The beaker and its contents were substituted for the sample holder shown in Figure 2.

Volume resistivity determinations were made in the same manner as for molded slabs. The area of the electrode was taken as 32 in.² in all cases, and the average thickness of the individual slabs of vinyl was predetermined as follows:

$$\text{Average thickness, } t = \frac{\text{(average over-all thickness of sandwich)} - \text{(thickness of foil)}}{2}$$

The use of copper sandwiches was included in immersion studies and V.R. results in all cases show excellent correlation with V.R. results obtained using molded slabs. This correlation is indicated by the typical 20 hour immersion results shown in Table I.

Due to the fact that the preparation of copper sandwiches was rather time consuming and tedious, and the fact we obtained excellent correlation of results (V.R. of slabs versus V.R. of sandwiches), we discarded the use of copper sandwiches in our testing procedure.

Summary of Test Procedure

A brief summary of the test procedure, as adopted, is as follows:

1. Weigh the ingredients according to the formulation desired and hand mix prior to the milling procedure.

2. Mill for five minutes at 325°F. after fluxing on a two-roll Thropp mill and sheet off the stock at a thickness of approximately 90 mils.

3. After cleaning the mold thoroughly, mold one sample from each stock for 10 minutes at 175 lbs. steam pressure, followed by 100 tons dial pressure on the ram while cooling. Use a 4-cavity A.S.T.M. rubber mold and a Williams White press for the molding operation. The resulting specimens are 6 inches x 6 inches x approximately .075-inch.

4. Determine the average sample thickness in the proposed electrode area, and apply 60 mm. diameter silver paint electrodes using masks to insure proper alignment of the top and bottom electrodes.

5. Determine the volume resistivity of the discharged sample, using the Keithley electrometer and accessory equipment. Determinations of V.R. are made, using the same slab, after each of the following conditioning periods in the order indicated:

(a) At 25°C. and 50% R.H., after conditioning for a minimum of 24 hours after painting on the electrodes.

(b) At 90°C., after one hour conditioning at 90°C.

(c) At 60°C., after 20 hours immersion in water at 60°C., blotting dry, and drying for 15 minutes in a circulating air oven at 60°C.

The reproducibility of results obtained using this test procedure was determined as follows: Each of three operators prepared three individual stocks (Compounds I, II, and III). Each operator then prepared two molded slabs from each of his three stocks. V.R. results were obtained by each operator on his six individual molded slabs. The results showing the reproducibility obtained are shown in Table II.

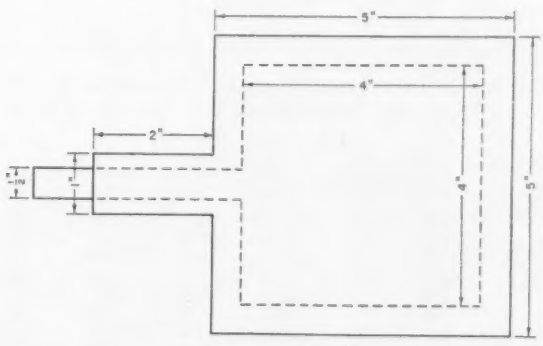


FIG. 3—Top view of copper foil sandwich. Dotted lines indicate outline of copper electrode.

TABLE II—REPRODUCIBILITY OF TEST RESULTS

Test Condition	Sample No.	Volume Resistivity (ohm-cms × 10^{12}) R.T.	90°C.	60°C."Wet"
		Compound I		
Operator X	1	900	3.9	6.4
	2	950	3.5	6.3
Operator Y	1	510	4.2	4.5
	2	740	4.5	4.6
Operator Z	1	650	3.3	4.5
	2	750	4.1	4.7
		Compound II		
Operator X	1	740	0.97	.20
	2	720	0.95	.20
Operator Y	1	460	1.20	.18
	2	450	1.00	.16
Operator Z	1	430	1.30	.19
	2	620	0.94	.17
		Compound III		
Operator X	1	160	.14	.21
	2	150	.15	.22
Operator Y	1	140	.18	.21
	2	150	.19	.20
Operator Z	1	140	.16	.26
	2	130	.17	.25

TABLE III—VOLUME RESISTIVITY OF SLAB (OHM-CMS × 10^{12}) VERSUS INSULATION RESISTANCE OF WIRE (MEGOHMS PER 1,000 FEET)

Compound	R.T. Dry [a] V.R.	Rank	I.R.	Rank	60°C. "Dry" [b] V.R.	Rank	I.R.	Rank	60°C. "Wet" [c] V.R.	Rank	I.R.	Rank
I	90	8.0	340	8	0.42	7	3.4	7	.04	8.5	.29	9
J	390	5.0	1240	5	1.30	6	9.0	6	.04	8.5	.47	7
K	40	9.0	160	9	0.18	9	1.2	9	.08	7.0	.46	8
L	900	3.0	3320	3	3.70	5	40.0	5	.77	4.0	7.60	3
M	150	6.0	930	6	0.30	8	1.9	8	.10	6.0	.66	6
N	730	4.0	3650	2	24.00	2	88.0	1	1.90	2.0	12.40	1
O	125	7.0	570	7	7.00	4	43.0	4	0.33	5.0	1.50	5
P	1500	1.5	2700	4	28.00	1	54.0	3	2.80	1.0	6.20	4
Q	1500	1.5	3960	1	22.00	3	84.0	2	1.80	3.0	8.80	2
Statistical Analysis												
Spearman Coefficient	0.715				0.847				0.565			
Significant Level	0.125%				0.05%				0.31%			

(a) Slabs conditioned for 24 hours and wire samples immersed for five minutes at R.T. (b) Slabs conditioned for one hour at 60° C. and wire samples immersed for five minutes at 60° C. (c) Slabs immersed for 20 hours at 60° C., dried for 15 minutes at 60° C. Wire samples immersed for 20 hours at 60° C.

Correlation of V.R. with I.R. Results

In order to determine the practical significance of the DC resistivity values obtained, there was initiated a two-phase program in cooperation with several manufacturers of electrical compounds and insulated wire. Several experimental compounds were prepared and extruded on wire by the General Cable Co., Bayonne, N.J. In addition, the B.F. Goodrich Chemical Co., Avon Lake, Ohio, Monsanto Chemical Co., Indian Orchard, Mass., and the Firestone Plastics Co., Pottstown, Penna., furnished several samples of commercial insulated wire. In all cases control samples of the vinyl compound which had been used to insulate the test samples of wire were also obtained. Molded slabs from each of these compounds were prepared.

The test conditions for the determination of volume resistivity of these slabs were: (a) at room temperature; (b) at 60°C. after one hour conditioning at 60°C., and (c) at 60°C. after 20 hours immersion in water at 60°C. followed by the drying procedure described above.

The corresponding test conditions which were chosen for determination of insulation resistance of the wire samples while immersed in water were as follows:

(a) At room temperature after five minutes immersion in water.

(b) At 60°C. after five minutes immersion in water at 60°C.

(c) At 60°C. after 20 hours immersion in water at 60°C.

Since insulation resistance measurements were to be made while the samples were immersed in water, the five minute immersion periods in (a) and (b) were chosen as most closely representing those of the dry conditions used for molded slabs.

Insulation resistance measurements were calculated according to the following formula:

$$\text{I.R.} = \frac{R_x\, 1}{1000}$$

where, R_x = resistance of the sample in megohms,
1 = length of wire in feet, and
I.R. = insulation resistance in megohms (per 1000 feet of wire).

The V.R. and I.R. results obtained on molded slabs and wire, respectively, using the test conditions above, and the relative rankings of the compounds, are shown in Table III.

Spearman rank correlation coefficients *(3)* were determined for each comparison and results indicate highly significant correlation between V.R. results on slabs with insulation resistance results on wire (see Table III).

In order to permit direct comparisons for the specific resistances of test slab versus wire insulation, the corresponding volume resistivities of the wire samples were calculated by converting from I.R. to V.R. on the basis of the area of the vinyl in contact with the conductor and the average thickness of the insulation. The comparison of volume resistivity results thus calculated with those from molded slabs is illustrated in Table IV.

Conclusions

Described is a test procedure for the determination of volume resistivity of molded slabs of plasticized PVC which is relatively simple, requires a small amount of test compound, and gives good reproducibility of results. In addition, these volume resistivity results show good correlation with insulation resistance results obtained on samples of insulated wire.

LITERATURE REFERENCES

(1) ASTM D-257-54T, Tentative Method of Test for Electrical Resistance of Insulating Materials, Revised 1954.

(2) U-L Standard for Thermoplastic Insulated Wires, Third Edition, April, 1948; reprinted July, 1954.

(3) Kendall, M. G., "Rank Correlation Methods," Charles Griffin & Co., London, England (1948).

TABLE IV—COMPARISON OF V.R. (SLABS) WITH V.R. (WIRE)
(ohm-cm × 10^{12})

Compound	R.T. Slab	R.T. Wire	60°C."Dry" Slab	60°C."Dry" Wire	60°C."Wet" Slab	60°C."Wet" Wire
I	90	56	0.42	0.61	0.04	0.05
J	390	224	1.30	1.60	0.04	0.09
K	40	28	0.18	0.22	0.08	0.08
L	900	648	3.70	7.30	0.77	1.40
M	150	158	0.30	0.35	0.10	0.12
N	730	721	24.00	17.00	1.90	2.50
O	125	109	7.00	8.00	0.33	0.29
P	1500	579	28.00	12.00	2.80	1.30
Q	1500	880	22.00	19.00	1.80	2.00

Editorials . . .

Rubber Prospects

NOW that the first quarter of the year is behind us it is time to take a look at the prospects for the year as a whole. This is a rather delicate task, insofar as rubber is concerned, especially with the knowledge that some of our best economists and statisticians misjudged total rubber consumption last year by some 150,000 to 200,000 long tons. However, nothing ventured is still nothing gained.

Despite the fact that the over-all economy of the United States is still riding high, no statistician was improvident enough at the beginning of the year to predict that the peak consumption of 1,525,000 long tons of new rubber reached in 1955 would be matched in 1956. The consensus of opinion indicated that 1956 total consumption would be approximately 1,475,000 long tons. The major reason behind the lower consumption estimates was the fact that a cut in automobile production was imperative.

Not only has there been a cutback in automobile production but it has been sharper in the first three months of the year than the late 1955 estimates. For instance, at the beginning of 1956 it was believed that approximately 6,800,000 cars were likely to be produced during the year. According to the Ward Automotive Reports, the most reliable in the automotive world, production of passenger cars for the first quarter of the year should have totaled 1,874,000 units—an annual production rate of 7,496,000 units. However, the actual figure amounted to 1,742,000 units, or an annual production rate of 6,968,000 units. These annual production rates must be taken with a grain of salt, since automobile production is definitely subject to seasonal trends. To aggravate the situation, the production of trucks is beginning to lag somewhat, and at this stage it is doubtful that 1956 production will even equal the 1,250,000 units produced last year.

All of the above would prove most painful to the rubber manufacturing industry, particularly the tire segment, were it not for the fact that due to aggressive selling on the part of the automobile dealers, aided and abetted by the factories, new car sales are setting new records. It is believed, but not yet verified, that new car sales in February totaled more than 505,000 units, which compares with 476,584 sold in February, 1955. In only two other years—1950 and 1951—have February registrations topped 400,000. True, dealer profits have been virtually invisible, since the all-out push for sales is geared to reducing stocks.

This situation will partially explain the optimism which is still felt in tire manufacturing circles. The more cars on the road, the greater the need for replacement tires. And the industry is expecting to set new records this year where replacement tires are concerned. Were it not for this strong feeling of optimism some panic might be felt in the tire industry, since tire inventories in manufacturers' hands within recent weeks have crept close to the 19,000,000 mark—an all-time high, and some 6,500,000 units above such inventory at the end of March, 1955. In addition, dealer stocks are around the 12,000,000 unit level.

What about some of the other segments of the rubber industry? Reports reaching us from all over the country indicate that business is still running along satisfactory levels, with some low spots in the midwest and the West Coast. One barometer applicable to the rubber industry is the demand for experienced chemists and production men and this demand is currently at its height. More important, at the moment, is the fact that the demand stems from almost every segment of the field, from adhesive producers to manufacturers of mechanical goods, from latex foam to tires, from drug sundries to molded goods in general.

In the light of the automotive situation and in the realization that 1956 is an election year, some of our rubber statisticians have reduced their estimates of new rubber consumption from 1,475,000 to 1,440,000 long tons. In view of our own findings we feel optimistic enough to hazard the opinion that an estimated 1,480,000 long tons of new rubber will be consumed in the United States in 1956.

Highlights Sidelights *of the News...*

April, 1956

Perhaps the last of the government-owned facilities for the production of synthetic rubber, the Louisville alcohol-butadiene plant, is now up for sale or lease . . . Bids for the property will be accepted by the Rubber Producing Facilities Disposal Commission until midnight, April 19 . . . The plant is presently under a three-year lease to Publicker Industries of Philadelphia—the only company which has expressed an interest in the facility (page 111).

The annual stockholders' meeting of the Seiberling Rubber Co., scheduled for April 23, will apparently be the scene of a battle for control of the company . . . During the past few weeks, charges and counter-charges have been heard from the Seiberling management and spokesmen for Edward Lamb Enterprises . . . One of the first matters on the agenda on April 23 will be a Seiberling proposal to increase the number of directors from the present nine to fifteen . . . Once this issue is settled, shareholders will be able to turn to the actual election of directors (page 112).

The board of directors of the University of Akron has approved the establishment of an Institute of Rubber Research at the University . . . The new Institute will carry on work in rubber research which has been in progress at the University since 1943 under the government's synthetic rubber program . . . The Institute will use facilities now occupied by the Rubber Research Laboratories and will be supported by grants from foundations, industrial concerns and governmental agencies and by contracts for research studies (page 115).

A striking feature of the Annual American Toy Fair held recently in New York City was the extensive use of vinyl in the flexible toy field . . . In some instances, vinyl has displaced rubber entirely . . . An innovation at the Fair was the use of urethane coatings, by one toy manufacturer, to add gloss to the products . . . The coating is said to make the toys color-fast, washable, and permits their sterilization in boiling water (page 121).

A preliminary report on the footwear industry for 1954 has been released by the Census Bureau . . . The report indicates that in that year the rubber footwear industry shipped products valued at $165,900,000, a decrease of 17% from 1947 (when the last Census of Manufacturers was taken) . . . The report states that average employment in the industry has dropped 35% since 1947 (page 122).

NEWS REPORTS and Industry Activities

LOUISVILLE ALCOHOL-BUTADIENE UNIT FOR SALE; GOODRICH-GULF TAKES POSSESSION OF INSTITUTE

ON March 22, the Rubber Producing Facilities Disposal Commission offered for sale or lease the government-owned alcohol-butadiene plant at Louisville, Ky., as well as equipment at Baltimore, Md., used in the manufacture of a catalyst for the production of butadiene from alcohol. The Disposal Commission announced that it would receive bids for both properties until midnight, April 19. Previously, on March 13, Congress passed, and sent to the President for his signature, a bill extending the life of the Disposal Commission long enough to put up for sale the properties noted. The Disposal Commission had been scheduled to go out of business on March 22. With the President's signature, the life of the agency was extended long enough so that the facilities could be sold. The alcohol-butadiene plant at Louisville was leased to Publicker Industries, Inc. of Philadelphia, Penna., last April, and is now in partial production. The catalyst equipment at Baltimore is presently in standby condition and is located on the property of the Davison Chemical Co. in Baltimore.

Before Congress passed the bill extending the life of the Disposal Commission and authorizing the sale of the two facilities, an inter-agency hassle developed between the Disposal Commission and the Federal Facilities Commission over which agency would handle disposal. FFC registered "strong opposition" to a suggestion by the Disposal Commission that the former handle any disposal authorized by Congress.

FFC Offers Protest

Protesting on behalf of FFC, Administrator Laurence B. Robbins replied ". . . although we realize that the Disposal Commission has been continued in existence for a much longer time than contemplated under the original legislation and in all justice should be relieved of its responsibilities at as early a date as possible, we feel nevertheless that the Commission is the proper agency of government to deal with the disposal of this plant. . . ." Apparently, the FFC view prevailed, and the Disposal Commission has undertaken disposal of the facilities.

At this point, Publicker Industries, present operator of the Louisville plant, is the only firm to have expressed an interest in the facility. Publicker's three-year lease expires in April, 1958. Laurence R. Brown, an official of the company, told the Senate Banking and Currency Committee during hearings on the bill that his company wanted to launch a capital expansion program at Louisville but could not do so without a long-term commitment from the government.

He said that Publicker would like to buy the plant "if we could negotiate a favorable contract," but added that a long term lease would be satisfactory. Mr. Brown emphasized that Publicker was "pioneering" private production of alcohol-butadiene and indicated that no other firm could make it economically at this time.

Among the present buyers of Louisville's 30,000 ton annual output, Mr. Brown said, are American Synthetic Rubber Corp., Firestone Tire & Rubber Co., and Standard Oil of New Jersey. Another customer, Shell Oil, supplies its own alcohol for conversion. A good potential customer for butadiene is Goodrich-Gulf Chemicals, Inc., new owner of the synthetic rubber plant at Institute, West Va.

Only Interested Company

The Disposal Commission told the Senate Committee that Publicker was the only firm to have expressed an interest in the Louisville plant. In addition, the Commission called the possibility of sale "limited," and said long term lease would be a "more feasible" method of disposal.

Further, the Disposal Commission stated that sale subject to the lease now in effect would "discourage bids from anyone but Publicker." In the event of sale to some other firm, however, the Commission said Publicker "should be protected" on the unrecovered portions of its "substantial" investment in Louisville.

It is to be noted that an amendment to the bill passed by the House and Senate calls for Congressional review of a long term lease as well as the sale of the plant.

Takes Possession of Institute

On February 21, Goodrich-Gulf Chemicals, Inc., took possession of the synthetic rubber plant at Institute, West Va., and immediately announced a program to modernize the huge facility. The company has already begun the activation of one of the three lines at the 122,000 long ton plant.

The plant, for which Goodrich-Gulf paid $11,000,000 plus $330,000 for spare parts and equipment, will provide employment for several hundred persons in the first stage of operation and for approximately 600 persons when all three production lines are in operation.

W. I. Burt, president of the company, said that a major part of the production of the plant would be made available to small businesses. Not only will the company continue the intensive research program for the development of new and improved synthetic rubbers, but it also plans to install additional laboratory facilities to provide technical assistance to purchasers of synthetic rubbers, Mr. Burt stated.

Carbon Black Plant for Brazil

Celanese Corp. of America and the Columbian Carbon Co., have announced that a furnace-type carbon black plant with an annual minimum capacity of 30,000,000 pounds will be built near Santos, Brazil. The plant will be built by Copebras (Companhia Petroquimica Brasileira). The plant site has been purchased and permits to import materials, equipment, and machinery from the U. S. have been issued by the Braziiian Government. A ten-year contract for raw materials has been signed with Petrobas, the government-controlled oil company. Construction will be put under way promptly. Copebras is a Brazilian corporation, owned through holding companies, by Celanese, Columbian Carbon, Joseph S. Michaan, a New York businessman, and Brazilian interests.

SEIBERLING-LAMB BATTLE LOOMS AT ANNUAL MEETING ON APRIL 23

The management of the Seiberling Rubber Co., Akron, Ohio, on March 15 revealed some of the strategy it has mapped to prevent Edward Lamb from seizing control of the firm at the annual stockholders' meeting on April 23. Stockholders will be asked to increase the number of directors from 9 to 15. Management's proxy statement, mailed to stockholders on March 14, nominated 11 candidates for the board, including the present nine members and two new nominees. This would leave four places on the board for the Lamb interests.

Mr. Lamb nominated seven for the present nine seats in a statement filed with the Securities and Exchange Commission on March 9. Since then, he has added two more. Seiberling management's new candidates are Paul A. Frank, president of the National Rubber Machinery Co., and Lisle M. Buckingham, Akron attorney.

President J. P. Seiberling told stockholders that this was the "most important proxy ever mailed by the company." He pointed out that the company had the highest sales in its history in 1955, profits were five times greater than the year previous, and that the outlook for 1956 is good.

"I am convinced most stockholders will agree it is better to have the company grow on a sound basis than to be added to the collection of smaller companies Mr. Lamb has been busy acquiring either at the bottom or at the top of his financial pyramid," Mr. Seiberling wrote. The statement explained that the larger board would prevent a stalemate which might result on a nine-man board if one member were absent.

To Vote for Directors

First order of business at the stockholders' meeting will be to determine the number of directors to be elected. Seiberling's by-laws provide for not less than 5 nor more than 15. Management will offer a resolution increasing the number to 15. This will be the first test of strength between the management forces and the Lamb interests. Once that issue is settled, shareholders will be able to turn to the actual election of directors.

Under the cumulative voting system used at Seiberling, each share of stock is entitled to as many votes as there are directors. If there is to be a fifteen-man board, each side can cast 15 votes for each share it controls. The 15 votes may be divided in any manner desired.

With 15 directors to be elected, it takes 6⅔ per cent of the stock voted at the meeting, plus one share, to elect a director. On a 9-man board, it requires 10% of the stock voting, plus one share, to elect a director.

Management's proxy statement said that Mr. Lamb's holdings filed with S.E.C. on March 6 showed direct ownership of 62,831 shares. With the holdings of his associates, the total is 79,241 shares out of 414,916 shares outstanding.

In February, Mr. Lamb claimed that he had 115,000 shares in demanding that he be given 5 of the 9 seats on the board, or 4 directorships plus an executive officer and member of the 3-man Executive Committee.

The Seiberling family's holdings on March 12 were listed at 50,996. Coupled with director's holdings, management had a total of 55,282 shares, not counting stock owned by management associates. Earlier, Mr. Seiberling said management could "pinpoint" at least 100,000 more shares in the hands of people sympathetic with present heads of the company.

Withdraws as Nominee

Meanwhile, on March 19, one of Mr. Lamb's candidates for a directorship in Seiberling Rubber, Lewis W. Trayser, Philadelphia business consultant, withdrew as a nominee. Mr. Trayser stated that at the time he agreed to be a candidate, he didn't know that a proxy fight for control of the firm would be proposed.

Frank C. Oswald, executive vice-president of Edward Lamb Enterprises, Inc., charged on March 15 that J. P. Seiberling, president of Seiberling Rubber, "exhibited irresponsibility to a marked degree" in his statements to the press. Mr. Oswald hit especially at Mr. Seiberling's statement that "Seiberling Rubber Co. is larger, no matter how measured, than all of Lamb's interests."

Mr. Oswald stated that "Mr. Seiberling has no knowledge and no way of knowing the facts on the size of the Lamb interests, their value and income, or how they compare with Seiberling Rubber Co. He said that Mr. Seiberling apparently wishes to frighten stockholders in his "inconsistent comment" concerning what Mr. Lamb would do if he gained control of the firm.

In a letter to Seiberling stockholders dated March 31, Mr. Lamb urged that his slate of directors be elected at the forthcoming meeting. By supporting his group, he said, stockholders will "help to elect a management that can put new blood and new life into the company."

Compares Company Performance

In presenting what he called "The Seiberling Story" to stockholders, Mr. Lamb compared the company's performance in the past five years with those of Dayton Rubber, Armstrong Rubber and Lee Rubber & Tire. Mr. Lamb declared that starting in 1950, Seiberling's profit before taxes went steadily downward for the next four years and in 1955 it was still 40% less than in 1955. "Though the average for the other three companies varied through the years, profits before taxes were nonetheless substantial, and in 1955 exceeded that of 1950," the letter said.

Mr. Lamb also stated that another reason that the company is not doing what he thinks it should is that present management "preferred to follow the path of setting up a family dynasty rather than acquire the best available executives who would have followed the sound business dictates of diversifying many years ago."

In a letter dated April 2, J. P. Seiberling told stockholders that Mr. Lamb's record as a company "builder" does not justify his bid for control of the firm. Mr. Seiberling quoted Mr. Lamb's press and radio statements that he wants to "build" the tire company, and contrasted them with the management record at Air-Way Industries, Inc. Mr. Lamb won control of Air-Way in a proxy fight in 1954.

NATURAL RUBBER BUREAU SETS NEW THEME FOR FUTURE EFFORTS

"Natural Rubber . . . A Product of Nature *plus* Science" is the theme that will spark the natural rubber industry's future efforts in this country, H. C. Bugbee, president of the Natural Rubber Bureau, Washington, D.C., announced recently. "Actually there is nothing really new to this approach," Mr. Bugbee stated. "We're just giving it a label. Natural rubber has been carrying on basic research since the beginning of the century. Most of the rubber products we enjoy today grew out of research carried on by the manufacturing and growing industries.

Recently, however, with the advent of synthetic rubber and the many advances made in that field, there has been a tendency to overlook the research efforts continously conducted by natural. Also, natural's efforts are currently concentrated in laboratories in Southeast Asia, England, France and Holland.

The locations may seem somewhat remote, but the products and new processes being developed in these research centers are well worth noting. Some of them are already known to the American market. One is now being tested by a leading rubber manufacturer. It won't be too long before others will be introduced here. Undoubtedly these products will affect American rubber consumption in the years immediately ahead."

Cites Agricultural Advances

In referring to these product advances, the Bureau spokesman stressed that "one should not forget the agricultural strides being made at the same time." In the Rubber Research Institute of Malaya and other laboratories, research is now being carried on that will up production per acre as much as four times. That means that in seven years, when trees now being replanted start producing, these replacement trees will produce four times as much as their predecessors, with no additional acreage or labor requirements. By markedly reducing production costs in this way natural will be in a strong position to compete on price, Mr. Bugbee declared.

The natural rubber industry is keenly aware that the advent of synthetic rubber has brought it face to face with a broadening technological problem that calls for researching a wide range of more useful rubbers. The industry is facing this problem with laboratory findings that have already made outstanding strides. It looks forward to greater advances in the stepped up research program that is now being planned.

"Natural Rubber . . . A Product of Nature *plus* Science," Mr. Bugbee noted "reflects in sum-total this over-all research approach, including accomplishments to date and advances projected for the future."

An index to Volume 78 of RUBBER AGE will be found on Pages 183 to 186 of this issue.

THREE PAPERS PRESENTED AT N. Y. GROUP SPRING MEETING

Approximately 180 members and guests of the New York Rubber Group attended the Spring Meeting held on March 23 at the Henry Hudson Hotel in New York City. The meeting featured the presentation of three technical papers and a sound motion picture. After the technical portion of the meeting, members participated in a cocktail hour, dinner, and a program of entertainment by Cardini, world-renowned sleight-of-hand artist.

The first speaker, Raymond R. Waterman of the R. T. Vanderbilt Co., Norwalk, Conn., first showed a motion picture entitled "Latex Foam". This movie showed the manufacture of latex foam from tapping the tree to packaging the finished foam article. The film stressed the role that automation plays in the manufacture of molded foam articles.

In his address, Mr. Waterman explained that latex foam is made by two processes —the Talalay process and the Dunlop process—and described the differences between the two methods. The latex compounder must be well versed in colloidal as well as rubber chemistry. Latex foam consists of two dispersion systems initially, air in serum and rubber globules in serum. The air cells must be discrete during the foaming in both the Talalay and Dunlop systems. The foam is quick frozen in the Talalay process to prevent collapse when the cell walls rupture. In the Dunlop system, the gelling action is so controlled that the rubber/serum coagulates before the air cells become interconnecting.

Cites Compounding Requirements

The foam compounder desires an acceleration system that will give maximum load carrying capacity per unit weight, he stated. Antioxidants used in foam must be non-discoloring to satisfy the consumer. The following requirements must also be met: lack of cell tack; low odor level; low compression set; uniform compression modulus during life of product, and long aging.

Mr. Waterman declared that in the future, latex foam will be available:

(1) With controlled resilience or rebound. This will eliminate the "fight back" which some persons object to in foam pillows.

(2) With greatly increased compression resistance for non-personal uses. This will permit foam to be used in packaging and decorative applications.

(3) Using new elastomers with tailor-made properties to fill specific needs such as: (a) Greater fire resistance; (b) Greater solvent resistance, and (c) Higher operating temperatures.

(4) Containing open and closed cells. The closed cells will give buoyancy in water and the open cells will allow air circulation for cushioning comfort.

(5) With more uniform processing characteristics to cut down scrap and improve quality.

In summary, the speaker said that the use of latex foam will increase as new and improved elastomers are developed along with improvements in compounding and processing.

The second speaker at the meeting, R. S. Havenhill of the St. Joseph Lead Co., Monaca, Penna., spoke on the "Electrostatic Contact Potential Theory of Reinforcement". His talk included a demonstration of the electrical potentials of rubber compounding, and he outlined the manner in which reinforcement is explained on the basis of the strong electrostatic attractive forces between the positive pigments and the negative rubber.

The role of the electrical potentials in determining the breakdown of the rubber and the proper sequence and timing of the milling operations during Banbury mixing was also discussed. Electrostatic mixing charts were presented which show that by making the electrical charge on zinc oxide more positive (by coating), its incorporation rate can be increased. The positive (+) coating also produces improved dispersion and a 20% savings in power consumption.

By following the changes in electrical potential of the rubber during mixing, with the new equipment described, it should be possible to improve on quality through better dispersion and also to reduce costs through proper sequence and timing of the mixing operations, the speaker stated.

The final speaker at the meeting was E. B. Newton, manager of polymer utilization research at the B. F. Goodrich Research Center, Brecksville, Ohio. Mr. Newton spoke on "Ameripol SN—A Synthetic Cis-1, 4-Polyisoprene". Mr. Newton observed that attempts to determine the nature of crude natural rubber date from the time of Michael Faraday. In the subsequent 130 years substantial effort has been directed toward polymer configuration and synthesis.

It is in a way surprising that the last 15 months have seen the announcement from three different laboratories of the synthesis of polymers essentially like Hevea rubber. The discussion here dealt with the properties of a polymer, called Ameripol SN, made with a Ziegler-type catalyst acting on an isoprene monomer system. Physical methods of analysis, such as infra red spectra and X-ray diffraction patterns, show the polymer has a cis-1, 4-polyisoprene configuration essentially like that of Hevea rubber.

After a small addition of lecithin and triethanol amine to act as a buffer material, the stabilized polymer produces vulcanizates in standard stocks showing physical properties, such as stress-strain and low hysteresis values, like those of similar Hevea rubber vulcanizates. The performance of 11.00 x 20 heavy duty tires, made entirely with Ameripol SN rubber, was comparable to that of similar Hevea rubber tires run in indoor tests.

C. R. JOHNSON ANNOUNCES INCORPORATION OF SPENCER PRODUCTS CO.

Cleon R. Johnson

Spencer Johnson

Cleon R. Johnson has announced that as of April 1, 1956, Spencer Products Co. of Ridgewood, N. J., has become a corporation. Mr. Johnson will serve as president and treasurer of the new corporation, Spencer Products Co., Inc., while his son, Spencer Johnson, will serve as vice-president. Spencer Johnson recently joined the firm after fourteen years with the Research and Development Department of Congoleum-Nairn, Inc. It has been announced that there will be no change in the manufacture or sale of "Ridacto," the accelerator-activator which is the company's chief product. To broaden its line, Spencer Products' recently-established research laboratory is now engaged in furthering the development of several specific materials for the rubber and plastics industries. In the February, 1956, issue of RUBBER AGE, there appeared the original item which announced that Spencer Johnson had joined the staff of Spencer Products. At that time the photograph of Spencer Johnson, which was used to illustrate the story, was incorrectly identified as "C. R." Johnson. The correctly captioned photographs appear above.

CONNECTICUT GROUP HEARS ERNST ON RECENT BUTYL DEVELOPMENTS

The Connecticut Rubber Group held its first meeting of 1956 on February 24th at Tiernan's Restaurant in West Haven, Conn. Chairman James Boyle (Armstrong rubber) presided at the meeting and introduced the principal speaker of the meeting, Jack Ernst of the Esso Research and Engineering Laboratories, Linden, N. J.

Mr. Ernst presented an interesting topic, "Recent Developments of Butyl Synthetic Rubber" accompanied with appropriate slides. The speaker touched on the growth of Butyl as a polymer for use in tire tubes and the more recent trend of growth which shows a higher percentage of the polymer consumption going into commodities other than tubes.

Butyl is finding much acceptance in the wire insulation field and is also growing in use in the mechanical field. Development work on a pilot scale is being carried on with one of the tire producers which indicates that Butyl may have a definite place as a polymer for sidewall and tread stocks. Another use that appears to be very promising is in sponge underlay and in sponge automotive weatherstripping, he stated.

Optimum compounding of Butyl was also presented and methods were discussed to bring forth the optimum in the following properties: heat aging, chemical resistance (acids), ozone resistance, high physical properties, electrical resistance, abrasion resistance, low temperature elasticity, impermeability to gases.

The meeting was one of the best attended of the winter meetings and marked a very good start for the group in the Tenth Anniversary year. On February 23rd, the night preceding the above meeting, a dinner was given at the Stratfield Hotel in Bridgeport, Conn. by the Executive Committee to honor the past-chairmen and founders of the Group and their wives. Charles R. Haynes of Carter Hill, Clinton, Conn., was the speaker of the evening.

Reuben Named Chief Chemist

Harold Reuben has been appointed chief chemist of Ace Rubber Products, Inc., Akron, Ohio. Mr. Reuben was previously with the Republic Rubber Division of the Lee Tire and Rubber Corp., Youngstown, Ohio. He joined Republic 10 years ago, after 5 years in the U. S. Navy where he was a Lt. Commander in Ordnance Research. Mr. Reuben, who is a chemical engineering graduate of Ohio State University and who received his M.S. from Cornell, has been teaching evening classes in chemistry at Youngstown College. In his new capacity as chief chemist for Ace Rubber Products, Mr. Reuben will enlarge the research and testing laboratories, extend the use of color in rubber and collaborate with William Crocker, new product development engineer, in the creation of new products to be added to the Ace line of automotive and household rubber mats and matting.

Take issue with something in this edition? Write a letter to the editor! (See page 14).

Coming Events in the Rubber Industry

Apr. 17. Elastomer and Plastics Group.

Apr. 18. Washington Rubber Group, PEPCO Auditorium, Washington, D. C.

Apr. 27. Chicago Rubber Group, Furniture Club, Chicago, Ill.

May 11. Buffalo & Ontario Rubber Groups, International Meeting, Hotel Sheraton-Brock, Niagara Falls, Ontario, Canada.

May 15. Elastomer and Plastics Group. Short Talk Symposium.

May 16-18. Division of Rubber Chemistry, A.C.S., Hotel Cleveland, Cleveland, Ohio.

May 16. Washington Rubber Group, PEPCO Auditorium, Washington, D. C.

May 25. Connecticut Rubber Group.

June 7. New York Rubber Group, Summer Outing, Doerr's Grove, Millburn, N. J.

June 8. Fort Wayne Rubber & Plastics Group, Summer Outing.

June 13. Buffalo Rubber Group, Summer Outing.

June 15. Boston Rubber Group, Annual Summer Outing, Andover Country Club, Andover, Mass.

June 17-22. American Society for Testing Materials, 59th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 21. Akron Rubber Group, Outing, Firestone Country Club, Akron, Ohio.

June 22. Detroit Rubber & Plastics Group, Summer Outing, Western Country Club, Detroit, Mich.

Aug. 2. New York Rubber Group, Golf Tournament, Innis Arden Golf Club, Old Greenwich, Conn.

Aug. 17. Philadelphia Rubber Group, Manufacturers' Golf & Country Club, Oreland, Penna.

Sept. 8. Connecticut Rubber Group, Summer Outing.

Sept. 19-21. Division of Rubber Chemistry, A.C.S., Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 27. Fort Wayne Rubber & Plastics Group, Hotel Van Orman, Fort Wayne, Ind.

Oct. 2. Buffalo Rubber Group, Fall Meeting.

Oct. 5. Boston Rubber Group, Fall Meeting, Hotel Somerset, Boston, Mass.

Oct. 5. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 5. New York Rubber Group, Henry Hudson Hotel, New York.

Oct. 26. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.

Oct. 26. Philadelphia Rubber Group, Poor Richard Club, Phila., Penna.

Nov. 16. Connecticut Rubber Group.

Dec. 4-5. Society of the Plastics Industry, Seventh Film, Sheeting and Coated Fabrics Division Conference, Commodore Hotel, New York City.

Dec. 5. Buffalo Rubber Group, Xmas Party.

Dec. 6. Fort Wayne Rubber & Plastics Group, Hotel Van Orman, Fort Wayne, Ind.

Dec. 7. Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 14. Boston Rubber Group, Xmas Party, Hotel Somerset, Boston, Mass.

Dec. 14. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

Synthetic Rubber in Japan

According to reports from Japan, two industrial groups are planning to start large-scale production of synthetic rubber by 1958. One of them, headed by Mitsubishi Petrochemical, will begin construction of new facilities this year with a production goal of 15,000 long tons of GR-S type rubbers a year. The other group, consisting of eight industrial companies formerly affiliated with the Furakawa combine, plans to produce 15,000 long tons of GR-S type, 1,500 long tons of GR-I type, 600 tons of Hycar and 5,000 tons of Ameripol-SN annually. Negotiations for technical assistance from the B. F. Goodrich Chemical Co. are now underway.

Minnesota Rubber Expanding

Construction began in February on the $500,000 expansion project of Minnesota Rubber & Gasket Co., Minneapolis, Minn., manufacturers of custom molded industrial rubber products. This is the firm's fourth expansion in less than three years. When completed in July, a three-story brick and concrete addition will increase present facilities by about 32,000 square feet. The first floor will give additional production area, the second will be devoted to new general offices and the third to research and engineering, including a complete testing laboratory. The laboratory and research center will help the firm to keep abreast of new developments in rubber materials.

LITCHFIELD LAUDS SALE OF SYNTHETIC RUBBER PLANTS

The government closed its books on ownership of America's synthetic rubber industry with a net profit instead of writing off the plants as war cost—like guns, planes and ships. This accomplishment stands out in a comprehensive analysis of the world rubber situation just released by P. W. Litchfield, board chairman of the Goodyear Tire & Rubber Co., as the latest in his series of "Notes on America's Rubber Industry."

With transfer of the synthetic plants from government to private ownership, every penny of public money invested in the plants — approximately $1 billion — has been returned to the federal treasury, together with a cash gain of at least $150 million, Mr. Litchfield said. This was done, he explained, by selling the output of the plants, during the period of public ownership, at a price which covered all costs and yielded an actual operating profit over the years.

"The high prices at which these facilities were sold by the government to private operators," he added, "made it possible to close the books with every confidence that the final profit figure would pass the test of the most rigid audit."

Reviewing the vital contributions of synthetic rubber to the nation's security and economy, he said that what started out to be a wartime substitute material had won a firm place in our economy, attaining the stature of an indispensable basic product.

Private Management Benefits

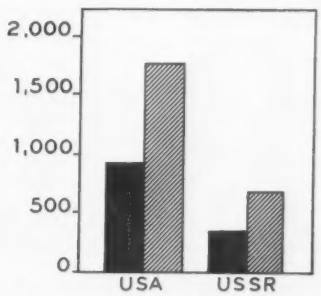
Under private management, he went on, additional benefits to rubber consumers the world over will accrue through more fruitful and comprehensive research, a program of expanded production, already launched by the private companies, and the steadying influence on raw rubber prices brought about by the available domestic source of rubber supply. Natural rubber prices will be held in line because synthetic now competes with the tree product over wide areas of use in manufacture.

"With adequate supplies of synthetic, we have protected our pocketbooks against the traditional tendencies of natural rubber suppliers to squeeze the last possible penny out of the market. No longer will these suppliers be able to boost prices at will — natural rubber must now compete in the open market with synthetic," said Mr. Litchfield.

Another advantage, he said, is that America is no longer entirely dependent upon the plantations, located half-way around the world, for rubber. This frees the country from an historic threat to the national security.

Within the next five years, he said, new rubber requirements will rise to 3,500,000 long tons. This is 400,000 tons more than the present capacity of natural and synthetic rubber combined (3,103,000) and 570,000 tons more than was produced in 1955 (2,931,000). Current consumption is at the rate of 2,885,000 tons.

Large increases in natural rubber supply cannot be made in time to meet the big additional demand, since it takes seven years from planting to tapping of rubber trees. Besides, political unrest in the major rubber-growing areas is discouraging new large scale plantings. "Obviously," he concluded, "the increased requirements for raw rubber will have to be met by the expansion of our synthetic rubber plants."



According to information published in the March 10, 1956, edition of "Chemical Week", the United States far outstrips the Soviet Union both in current production of synthetic rubber and in projected goals. The solid bar to the left shows U.S. synthetic rubber production in 1955. The shaded bar next to it shows projected U.S. production in 1960. The solid bar to the right shows Soviet production of synthetic rubber in 1955, while the shaded bar next to it shows a Soviet production estimate for 1960.

Sells Oil and Gas Properties

The sale by Witco Chemical Co., New York, N. Y., of all its oil and gas producing properties, amounting to 25 oil and gas wells, has been announced by R. I. Wishnick, Witco board chairman. Fifteen of these wells were sold to Producing Properties, Inc., of Dallas, Texas, for approximately $1,750,000. Formerly owned by Witco Oil and Gas Co., a wholly owned subsidiary of Witco Chemical, these properties are located in Moore, Hutchinson and Carson Counties of Texas, and Rio Arriba County, New Mexico. "Proceeds of this sale," according to Mr. Wishnick, "will be used in a long-range chemical expansion program. Our decision to dispose of all the oil and gas properties was made because they did not logically fit in with our plans for continued growth and expansion in the chemical field."

Hooker Transfers Sales Group

Hooker Electrochemical Co., Niagara Falls, N. Y., has made its Durez Plastics Division sales department responsible for sales of "Hetron," the company's line of fire-resistant polyester resins, in addition to the Durez line of phenolic resins and molding compounds. To facilitate the change, the Hetron sales group has been transferred from Niagara Falls to the Durez Plastics Division offices at North Tonawanda, N. Y.

AKRON UNIVERSITY ESTABLISHES INSTITUTE FOR RUBBER RESEARCH

The board of directors of the University of Akron, Akron, Ohio, has approved the establishment of an Institute of Rubber Research. The new institute will carry on extensive work in rubber research, which has been in process at the University since 1943 under the synthetic rubber program directed by the government.

Dr. Maurice Morton, who has been serving as director of rubber research and professor of polymer chemistry, was named director of the Institute. In recommending the establishment of the Institute, President Norman P. Auburn explained the move would "formalize work now being carried on and help us prepare for expansion."

The Institute will serve a four-fold purpose, Dr. Auburn said. He listed the purposes: (1) To aid in the advancement of knowledge about natural and man-made rubber and plastics by conducting fundamental, theoretical research in fields relating to polymer chemistry, (2) To prosecute basic research under contracts with government agencies and business and industrial organizations, (3) To aid the department of chemistry in the instruction of students in chemistry, particularly those interested in polymer chemistry, and (4) To provide a training ground for those aspiring to careers as research chemists and teachers of chemistry.

Itemizes Support Sources

The Institute will use facilities now occupied by the Rubber Research Laboratories in the University's Knight Hall and will be supported by grants from foundations, industrial concerns and governmental agencies and from contracts for research studies.

"The research program of the Department of Defense alone will justify the support of several fundamental projects here," Dr. Auburn told the board. "The University of Akron is certainly the logical choice in any basic question involving rubber."

Personnel of the present rubber research staff now serving with Dr. Morton will continue under the new Institute. The staff now includes 12 full-time chemists, six full-time technical assistants, and several part-time student assistants. The staff will be expanded to meet the needs of the Institute.

Dr. Morton, head of the new Institute, succeeded Dr. G. Stafford Whitby as director of rubber research when Dr. Whitby retired in 1954. Dr. Morton came to the University of Akron in 1948 as Dr. Whitby's assistant.

Educated at McGill University, Montreal, he had extensive experience in industrial chemistry before joining the faculty of Sir George Williams College, Montreal, as professor of chemistry in 1945. In addition to his classroom and research studies at the University of Akron, he has been active in various scientific organizations.

ACTION ON TEST METHODS TAKEN BY ASTM COMMITTEE D-11 AT MEETING

Some twenty subcommittees of ASTM Committee D-11 on Rubber and Rubberlike Materials held meetings in Buffalo, N.Y., from February 29 to March 2 during ASTM Committee Week. Action was taken on a number of new test methods which will be presented to the Society at its annual meeting in June in Atlantic City. A general meeting of Committee D-11, which is headed by Simon Collier of the Johns-Manville Corporation as chairman, was also held.

Among the accomplishments of the subcommittees was the completion of nine proposed tentative methods for the chemical analysis of synthetic elastomers, revised standard specifications for woven jacketed rubber-lined fire hose, revised specifications for ozone-resistant rubber insulating tape, minor revisions in the tentative methods of dynamic testing for ply separation and cracking of rubber products, approval of a method for Durometer D hardness, and a new tentative method for inter-laboratory testing of rubber and rubberlike materials. These and other accomplishments are reviewed below in the individual reports of the subcommittee chairmen.

Approximately 60 members and guests attended the general meeting, which was held in the Hotel Statler on Thursday evening, March 1, with Mr. Collier presiding. It was announced that the "Glossary of Terms Relating to Rubber and Rubberlike Materials," which has been five years in the making, will be ready for distribution shortly. The Glossary, containing definitions of over 2300 terms, was compiled by a special committee, and was edited by Arthur W. Carpenter, secretary of Committee D-11. It will be published with a heavy paper cover as STP No. 184 and will sell for $2.25 per copy to ASTM members and $3.00 to non-members.

Changes in Chairmen Announced

Several changes in subcommittee chairmen were announced, as follows: R. A. Bonnell (Goodyear) is the new chairman of Subcommittee 1 on Mechanical Rubber Hose; C. D. Pickells (Consolidated Edison) is chairman of Subcommittee 9 on Insulating Tape; W. Dermody (Stokes Molded) now heads Subcommittee 23 on Hard Rubber. It was also reported that S. S. Kurtz, Jr. (Sun Oil) is the new D-11 representative on Committee D-16.

Mr. Carpenter advised that a number of methods and specifications had been approved on December 19, 1955, by the Administrative Committee on Standards. These included: Tentative Methods for Chemical Analysis of Rubber Products (D-297-55T); Tentative Method of Test for Indentation of Rubber by Means of a Durometer (D-676-55T); Tentative Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D-735-55T); Tentative Method of Test for Resistance to Accelerated Light Aging of Rubber Compounds (D-750-55T).

Also, Tentative Method of Test for Viscosity of Rubber and Rubberlike Materials by the Shearing Disk Viscometer (D-927-53T); Tentative Method of Test for Curing Characteristics of Vulcanized Mixtures During Heating by the Shearing Disk Viscometer (D-1077-49T); Tentative Method of Test for Accelerated Ozone Cracking of Vulcanized Rubber (D-1149-51T); Tentative Specifications for Sheet Rubber Packing (D-1330-55T).

A report on the Sixth Meeting of ISO/TC 45 which was held in Dusseldorf, Germany, in September, 1955, was made by R. D. Stiehler (National Bureau of Standards). Amendments were made to the sixth draft ISO Recommendations submitted to the member nations during the previous year. As amended, the United States has given final approval to the ISO Recommendations for tear strength, hardness and mechanical stability of latex. Approval, subject to minor modifications, was given to the ISO recommendations for rubber-fabrics adhesion and tensile stress-strain.

Draft ISO Recommendations

The following proposals were approved for submission as Draft ISO recommendations: Sampling of Latex, Flex Cracking, Cut Growth, Aging, and Aging in Cell Type Oven. In addition, the following proposals were approved subject to postal approval of revised drafts: Copper, Manganese, Dirt in Raw Rubber, and Low Temperature Brittleness.

Substantial progress was made in reaching agreement on several other proposed methods, including standard test conditions. Several requests were received for specifications of rubber products. The Secretariat has tabled these requests temporarily, since ISO/TC 45 has not progressed sufficiently far on methods of test. However, it was agreed to discuss the question of product specifications at the next meeting.

The Seventh Meeting of ISO/TC 45 is scheduled to be held in Zurich, Switzerland, during September, 1957.

Some discussion at the general meeting was held on the possibility of holding an International Rubber Meeting in the United States in 1959. As pointed out by Dr. Stiehler, ISO/TC 45 will meet sometime that year and it might be advisable to have the meeting in the states. Accordingly, Dr. Stiehler suggested that a five-day International Meeting might possibly be arranged as a joint venture of the American Society for Testing Materials, the American Society of Mechanical Engineers and the ACS Division of Rubber Chemistry. Following this meeting, ISO/TC 45 would hold its regular meeting. Chairman Collier announced that he will shortly name a committee to investigate the possibilities of the joint meeting.

Harry Bimmerman (DuPont), vice-chairman of D-11 and program chairman, stated that papers on hardness gauges and statistical control are planned for presentation at the annual meeting in June. L. V. Cooper (Firestone), liaison representative on government agencies, reported that slow progress is being made. J. J. Allen (Firestone), secretary of the SAE-ASTM Technical Committee on Automotive Rubber, gave details of some changes which have been made. (EDITOR'S NOTE: These are reported on below). R. E. Hess, of the ASTM staff, furnished some information on the California meeting which will be held on September 16. He indicated that a paper for this meeting will be supplied by R. B. Stringfield (Fullerton Mfg.).

Reports from the subcommittee chairmen follow herewith:

Subcommittee 1—Hose (R. A. Bonnell, Goodyear, Chairman): This subcommittee recommended certain revisions in D-296-49 (Standard Specifications for Cotton Rubber-Lined Fire Hose) for immediate adoption by the Society as standards at the annual meeting. These revisions will bring the ASTM standards in line with those of the Underwriters Laboratories and take into account the use of synthetic fibers in fire hose. Also included will be a change in the title. The subcommittee discussed revisions in D-380-51T (Methods of Testing Rubber Hose) and expects to complete this discussion at the next meeting in June, after which recommendations for changes will be made.

Subcommittee 5—Wire and Cable (J. T. Blake, Simplex Wire & Cable, Chairman): It was announced that the letter ballot on two minor specification changes were favorable. As the result of the recent meeting of the liaison committee with Subcommittee 16, it was recommended that wire and cable compounds not be included in a revision of D-735. The proposal to enlarge D-1350 to include detailed specifications on knitted coverings, wrapped coverings and nylon, rayon and glass braids was referred to the specifications section for study.

There was much discussion on various proposals to alter D-1351 on polyethylene insulated wire in order to allow inclusion of some of the newer experimental polyethylenes. It was decided to wait for recommendations from Committee D-20 before taking any action.

It was voted to restrict D-752 to black neoprene jackets and raise the physical requirements in D-753 for general-purpose colored neoprene jackets. When the details are worked out, this will be letter balloted.

It had been voted previously to publish a booklet containing the wire and cable specifications. Further examination of the large number of related specifications that should be included produced a rescinding of this vote.

Subcommittee 6 — Packings (F. C. Thorn, Garlock Packing, Chairman): Mr. Gavan presented a request from Tech A, Section 10, that D-1147 be

amended in the interest of greater clarity. These amendments were voted with certain minor changes. D-11 will be requested to include these in its letter ballot.

Progress reports were made with respect to tests on relaxation, scalability and revision of D-733. This work is actually going on within Tech A, Section 10, but it is expected that it will be cleared within Subcommittee 6.

A special section under the chairmanship of H. R. Koch set up to explore the possibility of writing an ASTM specification for the round gaskets employed in asbestos-cement pipe, reported that there were no technical difficulties involved in such a specification, but there was no agreement as to the desirability of writing one. The section will, however, remain in existence to see if these differences can be resolved.

Subcommittee 9—Insulating Tapes (C. D. Pickells, Consolidated Edison, Chairman): A task group proposed several revisions of D-69-52T (Friction Tape), D-119-48T (Rubber Insulating Tape) and D-1373-55T (Ozone-Resistant Rubber Tape). Letter ballots received from 22 members of the subcommittee approved these revisions without exception. However, the subcommittee decided at this meeting that further consideration should be given to improving the procedure for sampling, testing and rejecting. Also, the subcommittee agreed to revise the fusion test in D-1373-55T because the present test does not recognize the fact that tapes made of synthetic rubber compounds do not have the "quick tack" of natural rubber compounds, a characteristic which does not affect their performance in service.

Subcommittee 10—Physical Testing of Rubber Products (L. V. Cooper, Firestone, Chairman): The subcommittee voted to recommend to D-11 that the tentative write-up of the testing of O-rings be submitted to letter ballot as a separate specification.

The write-up of the calibration of the test machine in D-412, although accepted in the committee by letter ballot, was referred to a task group for further study. This committee was appointed as follows: W. N. Keen, Chairman, Dave Scott, H. Tangenberg and D. W. Yochom.

Dr. Bekkedahl presented a tentative write-up of the Bureau of Standards strain tester and the committee ordered it with certain changes submitted to letter ballot of the subcommittee.

A discussion of equivalent cure and the proper way to cure ½-inch compression slabs resulted in no definite action other than an agreement that this problem must be faced by some subcommittee of D-11.

Subcommittee 13 — Synthetic Elastomers (B. S. Garvey, Jr., Sharples Chemical, Chairman): Mr. Mason reported for his section that they had, in cooperation with the Statistical Quality Control Committee, set up a recommended method of sampling except for volatile matter. These methods are hereby recommended to the subcommittee for letter ballot.

Mr. Pryor stated that all the negative votes on a ballot of nine chemical tests had been resolved and the committee by unanimous vote recommends these tests for letter ballot in Committee D-11.

Section 3 on Physical Tests reported failure in regard to attempting to incorporate the test formula, compounding and mixing of synthetic rubber into D-15. The section was reconstituted and instructed to make new tentative methods for ASTM of Section D-4, 5, 6 and 7 of Government Synthetic Rubber Specifications. This new section will consist of Messrs. Cooper, Sackfield and Otto.

Mr. Patterson reported that a series of eight methods on Synthetic Latex had been agreed upon in his section and the subcommittee hereby recommends these methods for letter ballot in D-11.

In regard to nomenclature, the subcommittee reversed its previous action and hereby recommends to D-11 letter ballot the use of the letters SR for styrene type rubbers and BR for butadiene type rubbers.

The section on Reference Materials reported that they were quite sure the money would be available for the purchase of the "Standard Bale." The handling of the bale has not been finalized in regard to how the certification would be made and the method governing the setting of the price. This will be resolved in the next few weeks in meetings between this section and members of the Bureau of Standards.

Mr. Maassen reported the work of his section and the subcommittee by a vote of 14-5 recommended for letter ballot in D-11 the table showing SR descriptions. Also by a vote of 14-2 the committee recommended to letter ballot a table of a suggested numbering system for producers of polymers which do not fit into the SR descriptive tables.

Subcommittee 15—Life Tests for Rubber Products (G. C. Maassen, R. T. Vanderbilt, Chairman): Messrs. Mast and Milner of the Mast Development Company presented a movie of their newly developed ozone test chamber. Dr. C. W. Wadelin of Goodyear presented information pertaining to an improved method for determining ozone concentration. A proposed revision of D-518 was discussed and then referred back to the task group with instructions to change the title and scope of D-518 and to incorporate the new proposal as Section C of D-518.

Subcommittee 16 — Classification and Specifications of Rubber Compounds (J. F. Kerscher, Goodyear, Chairman): The meeting was opened with a brief review of the work to date on Allen's modification of D-735, Scoville's system (the German system) and a suggestion made by Dr. Stiehler. The results of a questionnaire circulated within Subcommittee 16 were studied. A task group of Subcommittee 5 (Wire and Cable) submitted a report wherein they rejected the proposed system covered by this questionnaire. Other groups, such as heels and soles, also indicated dissent.

The over-all results from this questionnaire on the D-735 modification were about ¾ affirmative. Significant minority dissent, however, indicated the need for still further understanding of this and other suggested classification systems and how they would be useful for several product classifications.

Dr. Stiehler commented on the recent ISO/TC 45 meeting held in Germany. It was agreed that ISO Document 252, which represents the discussion of Working Group VI on the ASTM D-735 and Netherlands N-1001 systems, and contains recommendations for a possible solution, be reviewed by a task group to develop a questionnaire for circulation within Subcommittee 16. This should help to determine our attitude toward this compromise solution.

Subcommittee 17—Tests of Hardness, Set and Creep (S. R. Doner, Raybestos-Manhattan, Chairman): Dr. Stiehler reported that the United States recorded the only negative vote on ISO Recommendation No. 50 on "The Determination of Hardness," and on the basis of our vote the method was modified so that the ISO scale now reads within approximately 2 points of the Shore scale throughout the range. We have now changed our vote through ASA to a positive vote. Dr. Stiehler moved and it was seconded by Mr. Juve that ISO Draft Recommendation No. 50 be submitted to Committee D-11 to letter ballot for inclusion in the ASTM Handbook. The motion was unanimously approved.

(Messrs. Havenhill and Chatten pointed out that the ISO procedure is apparently based on use of the Wallace "foot operation" instrument. Experience with this instrument to date indicates that it is not suitable for use at low temperatures. The deficiencies are associated with the high frictional features inherent in the design).

Mr. Frye presented a preliminary report on the extensive round robin test of hardness testing instruments he is conducting. To date, data from five of the nine cooperating laboratories has been received. We expect the report to

Literature of Rubber

The Divisions of Chemical Literature and Rubber Chemistry of the American Chemical Society are planning to hold a joint symposium on "The Literature of Rubber," at the 130th American Chemical Society Meeting, September 16-21, at Atlantic City. Offers of papers should be sent immediately, preferably with a 200-word abstract to the Symposium Chairman: Miss Hanna Friedenstein, Godfrey L. Cabot, Inc., Research and Development Department, 38 Memorial Drive, Cambridge 42, Mass.

be completed by the time of the June meeting.

The Chairman brought up the matter of micro hardness testing and was informed that an article on this subject appeared in the October-December, 1955, issue of *Rubber Chemistry and Technology*. It is my opinion that some thought should be given to this subject.

It was announced that the Mast Development Company is manufacturing the "Admiralty Indentometer" as developed by the Bureau of Ships.

Mr. Tillotson demonstrated a Method B compression set device which eliminates the use of shims, thereby simplifying the compression operation.

Subcommittee 18—Flexing Tests (B. S. Garvey, Jr., Sharples Chemical, Chairman): Dr. Stiehler reported that a number of minor changes should be made in D-430 and D-813 (DeMattia flex tests) to make them agree with the ISO proposals. He moved that a task group be appointed to take care of these changes. The motion was seconded and carried. This appointment will be made by the chairman in the near future.

Subcommittee 19 — Immersion Tests (W. N. Keen, DuPont, Chairman): The chairman reviewed briefly the activities since the last meeting. The subcommittee discussed the request from SAE-ASTM Technical Committee A concerning Reference Fuels No. 1 and 2. A motion was made and carried to add the following as a footnote to Table II of D-471-55T: "Reference fuels No. 1 and 2 specified in D-735 and D-1170 are available from Phillips Petroleum Co. of Bartlesville, Oklahoma."

A. C. Simon, chairman of Task Group A, reported that of the five laboratories in the round robin testing of two compounds in ASTM Oil No. 1 and 3 at 250°, 275° and 300° F. only one laboratory reported widely divergent results. There was no significant difference between specimens aged in an oil bath versus aluminum blocks. In view of these findings, Mr. Simon had appointed Messrs. Juve, Klein and Doner as a committee to advise Task Group A as to their next program. Mr. Juve submitted a report from this advisory committee which related that factors proving highly significant in both tensile and elongation tests were the effects of sulfur and the effect of the interaction between sulfur and water. Thus, contaminated test tubes may be a source of some of the trouble.

A committee made up of Messrs. Garvey, Chatten and Brown, and headed by Mr. Thorn, are going to review a method of working with liquids in volume change work at temperatures above their boiling points and make a recommendation.

The ISO Immersion method will be reviewed and a report available for the June meeting.

Subcommittee 20—Adhesion Tests (H. H. Irvin, Marbon Chemical, Chairman): Standard D-413-39 was reviewed and it was concluded that no revisions were necessary at this time. Mr. Howard Tangenberg, however, agreed to report at the annual meeting on any discrepancies between D-413 and Federal Specification 601, together with possible suggestions for revisions.

Correspondence received from ISO/TC 45 relative to their establishing standard adhesion tests were read together with the reply by the chairman of this subcommittee with suggestions that ISO follow the pattern of revised Method B of D-429 and the tentative revisions of Method A, both of which come close to the ISO recommendations in principle. This was satisfactory to the membership. Various test procedures were then discussed which might augment existing D-429 procedures.

Mr. W. Frye agreed to keep the members of Subcommittee 20 informed on progress in the area of Dynamic Fatigue Tests and to report at the annual meeting. Mr. Hugh Macey agreed to perform a similar task with reference to nondestructive tests for measuring adhesion of rubber to metal. Mr. P. J. Larsen is to get information assembled on desirable equipment for adhesion testing at elevated temperatures, along the lines of the D-429 Standard.

The revision of Method A of D-429 was thoroughly discussed and the chairman was authorized to have the revised Method A, including the changes, approved at this meeting and to request that the revised method be put to letter ballot of D-11 for inclusion in D-429.

Subcommittee 22 — Cellular Rubbers (H. G. Bimmerman, DuPont, Chairman): Several changes in D-1055-54T and D-1056-54T were submitted to the membership of this subcommittee and fourteen members returned ballots in favor of all the proposed changes. These changes cover the specifications for latex foam rubbers and sponge and expanded cellular rubber products. It is recommended that these changes be submitted to D-11 for letter ballot and incorporation in the specifications.

Subcommittee 23—Hard Rubber (W. J. Dermody, Stokes Molded Products, Chairman): The subcommittee decided to combine the sections on Asphalt and Hard Rubber under the Hard Rubber Section and to dissolve the Asphalt Section, the existing title of the subcommittee to remain the same. A method for soluble iron in battery products will be circulated for letter ballot of the subcommittee in advance of the June meeting and, if approved, submitted immediately to letter ballot of D-11.

A modified Elmendorf tear test was discussed as a tool for evaluating rubber and rubber alloy battery products. Further work will be dropped because of a lack of correlation with field experience.

Hardness testing of hard rubber and allied materials was discussed and it was decided to include a method for Durometer D hardness in D-530 in order to fill a need for a portable hardness tester.

Work presently under way in Committee D-20 on impact testing was reviewed and a task force under Robert Wentland of Richardson Co. was formed to draft an impact test method adaptable to both test specimen and finished product testing which would minimize or eliminate the effect of "working" the specimen by repeated impact as in existing falling weight tests.

A further revision of D-530 to substitute a heat distortion test on unannealed specimens at 264 psi fiber stress in accordance with D-648 for the present softening point test was approved for letter ballot of the subcommittee.

Existing methods of hot-cold cycling tests for asphalt battery containers will be reviewed and a procedure circulated for letter ballot for inclusion in D-639.

A proposed test for chlorides in hard rubber products and data from a previous round robin or acid absorption testing will be discussed at the next meeting.

The standard test temperatures as set forth in D-1349 were approved for inclusion in D-530 to replace the present test conditions.

A discussion of difficulties encountered in attempting to comply with obsolete customer specifications highlighted a need for greater consumer interest participation in this subcommittee.

Subcommittee 24—Tests for Coated Fabrics (K. L. Keene, U. S. Rubber, Chairman): D-751-52T was reviewed and found to need revisions due to changes in industry practices. A report by Mr. E. B. Roberts, chairman of the task group on adhesion, was approved with the exception of the section on jaw separation speed and method of reporting results. These matters were referred back to the task group for further study and the entire report will again be reviewed at the annual meeting in June.

Mr. McMannus was appointed to send out a questionnaire to determine the rate

Knowledge Own Reward

Cary L. Wellington, 35-year-old Stamford, Conn., engineer and inventor, won acquittal recently on a charge of speeding 65 to 70 miles an hour on the Merritt Parkway. He won by explaining a theory that the pressure in automobile tires has a direct impact upon the speedometer. Mr. Wellington told Judge John P. Knox that he was traveling 50 miles an hour. He said the tires on the State Police car that timed him appeared to be soft, which he said would give the speedometer a higher reading than its actual speed because less inflation would reduce tire circumference and speed up turning of the wheels. Judge Knox adjourned the court to a service station across the street, where Mr. Wellington's ability to judge tire pressures was checked with a gauge. On three of the four tires, he guessed right. Judge Knox acquitted him.

of displacement in machines used for hydrostatic resistances (high pressure method) and report back at the annual meeting. (D-815-47 was reviewed with no recommendations for change). The DuPont scrub tester was again reviewed at the request of Northrop Aircraft because it is in some AMS specifications. No action was taken because of lack of correlation between machines.

A new jig for conducting stitch tear tests was exhibited and a task group was set up to evaluate it. Task groups will be set up for tests on cold crack and flame resistance. Outdoor exposure testing was discussed but no action taken.

Subcommittee 25—Low Temperature Tests (R. S. Havenhill, St. Joseph Lead, Chairman): The negative vote in the D-11 letter ballot on D-832 (Low Temperature Conditioning Procedure) was resolved and the method will be sent back to the sectional committee for the necessary editorial changes. Further changes from the floor were agreed upon and these will also be incorporated in the method when confirmed by letter. These changes had to do with the change in crystallization temperature of neoprene from 0 to —10° C., which is more in line with results on present polymers and equipment, the use of newer types of cold box insulation (D-1197-54T), and a few other minor changes.

With regard to the ISO test procedures the chairman discussed the action taken on the four low temperature draft proposals at the recent meeting. It was pointed out that ISO was desirous of making the low temperature hardness instrument (MLI) conform as nearly as possible with the room temperature instrument (Wallace).

One of the two negative votes in the D-11 letter ballot was resolved when it was shown that there are now at least five low temperature hardness instruments in use and instruments are readily available from the Mast Development Corp. The other negative vote was resolved by agreement to hold up administrative action on the method pending further investigation regarding conformity of the two instruments as to size of indentor, major and minor loads, and the use of a foot. The following committee was appointed to investigate this point: I. Kahn (chairman), C. K. Chatten, Ross Shearer, W. A. Frye, Edison Powers and R. E. Ofner.

In this connection Mr. Chatten described the ISO Wallace instrument, pointing out its deficiencies for low temperature operation. Due to the location of the dial gage above the major load and spindle, only 30 grams of force is available to overcome friction from freezing. The MLI (Modified Admiralty) provides positive dial gage action with the entire 1000 gram major load acting through the dial gage. Furthermore, inaccuracies due to possible misalignment of dial gage and spindle are accentuated in the Wallace instrument because of flat to flat contact contrasted with point to flat contact in the MLI instrument.

FRENCH ELECTRIC CABLE AND CABLE MACHINERY STUDY GROUP VISITS U.S.

Executives of Witco Chemical Co. greeted leaders of a French electric cable and cable machinery study group at Witco's New York offices before an "information and question" luncheon at the Chemists Club, March 8. H. W. Rojas, Witco vice-president in charge of exports (behind desk), is shown discussing the luncheon agenda with (left to right) Jacques Michotte, French team leader and production manager of Ste. Electro-Cable, Paris; Marcel Bour, general manager of Etablissements Bour, Paris; and Gerard J. Lally, project manager for International Cooperation Administration, which is sponsoring the French group's tour in the United States. Included on the list of stops are such other prominent companies as DuPont, Sun Oil Co. and Owens-Corning Fiberglas Corp. The group also will meet with trade associations and federal government authorities during its tour of the United States.

When the executives return home early in April, they will prepare two reports—one for raw materials and one for equipment. Each company represented in the group plans immediate plant-level action on the basis of the reports and will arrange to keep other companies in its area informed of its progress. The facts brought back by the group also will be used in development of materials and in equipment research activities being carried out by France's Electric Cable Industry Productivity Committee.

Mr. Carpenter announced that at the annual meeting Mr. Chatten would present a report on a survey of hardness instruments, with particular reference to low temperature operation.

Mr. Kahn passed out copies of a new method of determining the speed of the solenoid striking arm in the Brittleness Test (D-746) and indicated further work was being done comparing this method with the French method. Mr. Shearer and Mr. Keen discussed the ISO German Proposal on Dynamic Tests in which the low temperature behavior of stocks was based on several points on the temperature - stiffness and temperature-energy curves. Copies of this proposal were circulated for further study.

Subcommittee 26—Processibility Tests (R. H. Taylor, Scott Testers, Chairman): Results of the letter ballots of D-11 to revise ASTM Methods D-927-53T and D-1077-49T were discussed.

Under new business, the chairman was authorized to see to it that a proposal be prepared for submission to ISO/TC 45 on the use of the Mooney viscometer for the determination of viscosity.

The chairman was authorized to recommend to D-11 that proper steps be taken to advance ASTM Method D-926-47T to standard with the inclusion of certain changes in the units which will be forwarded to the secretary in the near future.

The subcommittee authorized the chairman to appoint a task group to investigate the possibility of obtaining a more stable rotor for use in the Mooney viscometer. Mr. H. Van Buren Story was appointed chairman with C. L. Gable, H. C. Jones, George Decker and J. P. Haworth as members of the task group.

Subcommittee 28 — Statistical Quality Control (E. M. Bader, Goodrich, Chairman): The subcommittee membership, by voice vote, recommended that the revised "Proposed Tentative Recommended Practice for Planning Interlaboratory Testing" be submitted to letter ballot of the membership of Committee D-11.

Work by sections of the subcommittee on the following problems was reviewed: (1) Development of a sampling procedure to be used with a moisture content test of GR-S type elastomers; (2) Evaluation of round robin test data obtained on immersion tests on packing

materials; (3) Design and evaluation of a program for isolating causes for irregular stress-strain results obtained with immersion tests.

New problems before the subcommittee for future work are as follows: (1) Evaluate round robin data comparing Shore, Wallace, ASTM and Rex hardness instruments; (2) Review Committee D-11 standards and devise a standard system for determining sample sizes that are included with test methods. The subcommittee is in urgent need of additional members.

Subcommittee 29—Compounding Ingredients (A. E. Juve, B. F. Goodrich, Chairman): The first item of business was the consideration of the results of the last round robin test for the development of a set of test recipes for testing carbon blacks in rubber. A previous round robin had indicated that the test recipes (two based on natural rubber and one based on GR-S) were satisfactory except for the fact that at 50 parts loading of black, certain of the blacks gave very short breaking elongations on the stress-strain test.

In the current round robin, the effects of reducing the carbon black loading to 45 and to 40 parts were to be determined as well as the differences in results when mixing is accomplished in a Banbury or on a mill. A statistical analysis of the data showed the extent of these differences. After discussion it was decided that the black loading to be employed should be adjusted to the type of black as well as to the polymer and could vary from a minimum of 40 parts on up.

It was decided to appoint a task group to study means of modifying the milling procedures (either mill or Banbury) to bring them into closer agreement. It was further agreed to appoint a small group to analyze the data obtained in the two round-robins so far run with the objective of determining the feasability of employing reference blacks for all comparisons as a means of cancelling out much of the laboratory-to-laboratory variation.

With respect to D-15, numerous modifications are necessary as a result of recent developments. A task group is to be appointed to study these modifications and recommend the necessary changes.

One new standard material has been added by the Bureau of Standards since our last meeting. This is an SRF black supplied through the courtesy of the United Carbon Co.

Technical Committee on Automotive Rubber (J. J. Allen, Firestone, Secretary): Letter ballots have approved five revisions of ASTM D-735. These briefly were as follows: (1) Change in Title to read: "Specifications for Elastomeric Compounds for Automotive Applications"; (2) Change in working of the scope in line with title; (3) Deletion of paragraphs a and b in Section 5 and combining them with paragraph 1 to read: "Test results from finished products may not duplicate the values obtained from standard test specimens"; (4) Addition of asterisks to indicate most commonly used grades. These revisions have since been approved by Committee D-11 and will appear in the new printing.

Letter ballots approved changes in the burst pressure of SAE 100 R1 and SAE 100 R2 Hydraulic Hose. However, these changes have been held up by the SAE Tube, Pipe, Hose and Fittings Committee for further consideration.

Letter ballots approved a change in OD of Standard ⅝-inch ID Air Brake Hose in SAE 40 R2 to bring this hose in line with commercial practice.

Sub-section IV-H has organized Task Group A jointly with Subcommittee 19 to study the problem of obtaining constant results in fluid immersion tests at temperatures above 250° F.

Sub-section IV-L is conducting a round robin test to compare ASTM D-736 with D-746 methods for low temperature brittleness. This is necessary before approving D-746 as the official method for incorporation in D-735.

Sections X (Gaskets), XI (Oil Seals) and XI-A (O-Rings) have been combined into Section X (Automotive Oil Seals and Gaskets), with Mr. R. C. Waters as chairman. The work is divided as follows: Sub-section X-A (O-Rings), Sub-section X-B (Radial Oil Seals), and Sub-section X-C (Non-Metallic Gaskets).

A request has been made to D-11 that a footnote be added to D-471 advising that Reference Fuels Nos. 1 and 2 are now available from the Phillips Petroleum Co. They are required for use in D-1170. The Gasket Committee has not approved the use of Reference Fuels A and B but is now evaluating them.

Claremont Opens New Plant

Claremont Pigment Dispersion Corp. has begun production at a new plant at 39 Powerhouse Road, Roslyn Heights, L. I., N. Y. Company offices have also been moved to the new address. The firm was formerly located in Brooklyn, N. Y. New equipment at the Roslyn Heights plant has enabled the company to double its production. Claremont, a leader in the manufacture of dispersed colors for plastics, has added a new line of products with the manufacture of color granules for use in polyethylene. Claremont has also increased its production of dispersed colors for vinyl, polyester and epoxy plastics, as well as ink for the plastics industry. The new plant has more than 30,000 square feet of floor space organized into a one-story building. This permits a single flow of production from raw materials to finished product. A railroad siding and off-street truck platforms permit speedy movement of bulk materials.

Expanding Baton Rouge Refinery

Esso Standard Oil Co. has announced plans to spend about $40,000,000 for improvements and extensions to plant and equipment at its Baton Rouge, La., refinery. Construction of some of the new facilities has already begun and others will be started throughout 1956. It is expected that about two years will be required for completion of the projects. Among the projects to be undertaken will be facilities for increasing aviation gasoline production; lubricating oil, wax and shipping facilities; improvements to refinery utilities; and additional equipment for the production of ethylene and butadiene.

GODFREY L. CABOT CELEBRATES 95TH BIRTHDAY AT HIS DESK AS USUAL

Early in March, Dr. Godfrey Lowell Cabot (right), chairman of the board of Godfrey L. Cabot, Inc., Boston, Mass., celebrated his ninety-fifth birthday at his desk as usual. He is shown here with Owen J. Brown, vice-president and director of sales, looking over his birthday congratulatory messages received from all over the world.

ATTRACTIVE RUBBER PRODUCTS SHOWN AT NEW YORK TOY FAIR

As usual, rubber and rubberlike plastics products were much in evidence at the American Toy Fair held from March 5 to 14 at a number of locations in New York City. During the past few years, vinyl products have been making great inroads in the flexible toy field and, in some cases, have displaced rubber almost entirely. Esthetically speaking, major progress has been made both in the look and the feel of toys falling within the rubber and rubberlike plastics category. Over 14,000 buyers attended the fair, a new record, and business was reported to be 10-15% above that registered in the previous year.

Seen and noted at the Toy Fair was the line of "Swim King" swim and sports accessories displayed by the Globe Rubber Products Corp. of Philadelphia, Penna. The line included fins, goggles, masks, flippers, snorkels, etc. Globe Rubber also exhibited quoit and horseshoe sets. Bayshore Industries of Elkton, Md., was represented with a complete line of balloons, latex squeeze toys, vinyl inflated balls, and molded rubber masks.

Topstone Rubber Toys Co. of Bethel, Conn., also exhibited a line of molded rubber masks and novelties and its recently introduced "Paint-a-Puppet". The flexible rubber head of the puppet may be painted in a variety of ways with specially provided water-soluble, rubber-base paints. Ben-Her Industries showed its group of "Bend-Me" toys made of foam rubber. The toys are wired to assume any position. New to the line this year are "Ballerina" and "Bah-Bah Lamb".

Urethane-Coated Toys

Cupples Co., St. Louis, Mo., showed a most attractive line of "Aachen" balls, featuring unusual designs and "old world" charm. Ashland Rubber Products Corp. of Ashland, Ohio, was represented with a complete line of "Toytime" balloons in every conceivable color, shape and size. Rempel Manufacturing, Inc. of Akron showed its complete selection of molded toys. Rempel toys are now protected with a new urethane coating which adds a high gloss to the products. The coating is said to make the toys color fast, washable, and permits their sterilization by dipping in boiling water.

New to the Rempel line is a new "Life-Like" series. Feature of this group is a "Life-Like Pony" made of natural latex and mounted on a steel reinforced body. With a body size of 33½ by 19 by 7½ inches, and with a saddle height of 21 inches, the pony is the proper size for the young cowboy or cowgirl. Meticulously detailed, the pony also features the urethane coating.

Barr Rubber Products Co. of Sandusky, Ohio, exhibited its line of gas inflated balls, sponge balls, athletic balls, balloons and pet toys. Doughboy Industries, Inc., New Richmond, Wisc., showed its wading and swimming pools and a complete line of inflatable beach toys and beach accessories. Oak Rubber Co., Ravenna, Ohio, was on hand with its selection of toy balloons, "Squeeze-Me" toys and beach balls. Seamless Rubber Co. of New Haven, Conn., exhibited its play and beach balls, playground and athletic balls.

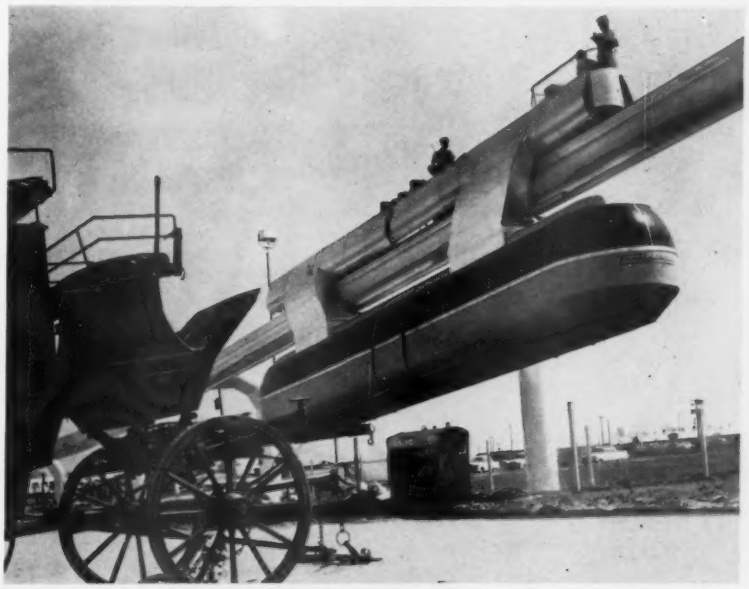
Fli-Back Sales Corp. of High Point, N.C., attractively exhibited its products including paddle ball games, sponge rubber balls of different sizes, toy rubber footballs and basketballs and balloons. Minnesota Mining and Manufacturing Co., St. Paul, Minn., and the Permacel Tape Corp. of New Brunswick, N. J., showed their ribbons and tapes. Collette Manufacturing Co., Amsterdam, N. Y., showed its line of sporting goods, and Martin Rubber Co. of Long Branch, N. J., exhibited its swim accessories, pitching games and printing sets.

Apex Tire & Rubber Co., Pawtucket, R. I., was represented with its rubber toys, including the "Safe-T-Play" pails and shovels. Hungerford Plastics Corp., Morristown, N. J., exhibited an interesting line of vinyl squeeze toys and dolls, including Disney character dolls. Sun Rubber Co. of Barberton, Ohio, placed on display an extensive line of rubber and vinyl dolls and toys.

Tillotson Rubber Co., Needham Heights, Mass., was represented by a group of rubber and vinyl products, including beach balls, balloons, etc. Also seen and noted at the Toy Fair was the use of colored ground rubber for do-it-yourself hobby railroaders in simulating grass and terrain.

The plastic wall tile industry, through the Plastic Wall Tile Division of the Society of the Plastics Industry, Inc., New York, N. Y., is celebrating its tenth anniversary by commencing an extensive public relations and merchandising program.

SKYWAY MONORAIL SYSTEM UTILIZES PNEUMATIC TIRES IN OPERATION



A possible answer to automobile traffic congestion and the problems of mass transportation is a suspended passenger coach gliding along underneath an overhead rail in Houston, Texas. It is the Skyway monorail, a rapid transit pilot system that is being operated in the city's Arrowhead Park by a group of Houston engineers and businessmen to demonstrate its practicality as a safe, economical and speedy means of urban and inter-urban transportation. Over a 970-foot freeway, an oval-shaped 50-foot coach, equipped with 28 pneumatic tires built by the Goodyear Tire and Rubber Co., moves along a single steel rail that is suspended 18 feet over the ground by a series of inverted J-shaped towers, 30 feet high. Although limited to moderate speeds by the short rail length, the car can travel at high speeds on a full scale line.

The Houston Skyway monorail is an improved version of the suspended coach system now in full scale operation in Wuppertal, Germany. Known there as the "schwebebahn", meaning the "floating car", the system has carried more than 900 million passengers during the past 53 years without a fatal accident. Adaptable to cities of any size with transportation problems, the monorail can travel aloft, on the surface or underground. It can be used for short, specialized trips, long intercity travel or for speedy, non-stop commuter service. Cars, with 60-90 passenger capacity, can run singly or coupled in the regular train fashion.

The 54-foot long blue steel ribbed coach is almost completely encased in fiber glass and solar glass. With its eight 8.25-15 "Traction Hi-Miler" tires built by Goodyear carrying the load and providing the traction and another series of twenty 4.00-8 Goodyear rib trailer tires serving as guide tires, the coach travels the rail virtually noise and vibration free. It is powered by two 305-horsepower gasoline engines.

CENSUS BUREAU RELEASES PRELIMINARY REPORT ON FOOTWEAR INDUSTRY

During 1954, manufacturers in the Rubber Footwear Industry shipped products valued at $165,900,000, a decrease of 17% from 1947, according to preliminary reports obtained from the 1954 Census of Manufacturers conducted by the Bureau of the Census, Department of Commerce. Average employment in the industry has dropped 35% since 1947 (when the last Census of Manufacturers was taken), to a total of 18,200 employees in 1954. Valued added by manufacture in the industry amounted to $106,800,000 in 1954, a decrease of 12% from 1947.

"Value added" is derived by subtracting the cost of materials, etc., from the value of shipments. It avoids, therefore, the duplication in the value of shipments which results from the use of products of some establishments as materials by others and is the best measure available for comparing the relative economic importance of manufacturing among industries and geographic areas.

The Rubber Footwear Industry, the Census Bureau explains, represents manufacturing establishments engaged primarily in the manufacture of all-rubber footwear, water-proof fabric-upper footwear, and other fabric-upper footwear having rubber soles. Establishments primarily engaged in manufacturing rubber, composition and fiber heels, soles, soling strips, and related shoemaking and repairing materials are classified in Industry 3099, "Rubber Industries, Not Elsewhere Classified."

Establishments primarily engaged in manufacturing footwear, except rubber, are classified in industry 3142, "House Slippers", or Industry 3141, "Footwear, Except Rubber", and plastic artics and gaiters in Industry 3971, "Plastic Products, Not Elsewhere Classified". The industry classification for the Rubber Footwear Industry used in the 1954 Census of Manufactures is based on the *Standard Industrial Classification Manual*, Volume I, Manufacturing Industries, 1945 edition.

Value of Shipments

The value of shipments, as reported by establishments classified in the Rubber Footwear Industry, consisted not only of products described above as primary to the industry, but also included the value of secondary products (which are primary to other industries). The $166,000,000 total value of shipments reported by establishments classified in Industry 3021, Rubber Footwear, consisted almost entirely of manufactured products with a negligible amount of miscellaneous receipts for sales of scrap.

The $166,000,000 product shipments were accounted for by $141,000,000 of rubber footwear and other products primary to the industry, and $25,000,000 of products primary to other industries (e.g. mechanical rubber goods, rubber heels and soles, and other rubber products). Thus, the industry's shipments of rubber footwear represented 85% of its total manufactured product shipments (primary and secondary).

This figure describes the "primary product specialization ratio", that is, the extent to which plants classified in an industry "specialize" in making products regarded as primary to the industry. The 1947 primary product specialization ratio for the industry was 80%. The increase in the "primary product specialization ratio" between the two years is due principally to a change in the method of reporting by plants engaged in producing, at the same location, rubber footwear as well as products classified in other industries. For 1954 the rubber footwear activity was reported as separate establishments, whereas the 1947 plant reports submitted covered both rubber footwear and products classified in other industries. This reporting change as well as other shifts in industry classification contributed significantly to the decline of average employment for the industry between the two census years.

Total Value of Shipments

The industry's total value of shipments should be clearly distinguished from the total value of primary products of the industry shipped by all producers. The latter figure, indicates that $163,000,000 value of rubber footwear and other products primary to industry 3021 were shipped by all producers. Of this total 86% was shipped by plants classified in Industry 3021, while the remainder was shipped as secondary products by plants classified in other industries. The figure 86% is known as the "coverage ratio", that is, it measures the extent to which all shipments of primary products of an industry are "covered" by plants classified in that industry, as distinguished from secondary producers elsewhere.

The general statistics (employment, payrolls, cost of materials, value of shipments, etc.) are reported for each establishment as a whole. Aggregates of such data for an industry reflect not only the primary activities of the establishments in that industry, but also their activities in the manufacture of secondry products and receipts for their other activities (contract work on materials owned by others, repair work, etc.). This fact should be taken into account in comparing industry statistics with product statistics which shows the shipments by all producers of the primary products of the industry.

Detailed Figures Scheduled

More detailed figures for this industry will appear later in the Census Bulletin, MC-30, "Rubber Products", which will be published and offered for sale at a later date by the Superintendent of Documents, U. S. Government Printing Office. Also, in this bulletin, there will be a comprehensive discussion of such concepts as "industry", "establishment", "secondary production", as well as the various statistical items such as "employment", "value added", etc. Similar advance reports and final bulletins will be issued for other industries during the coming months.

A summary of preliminary United States totals for each manufacturing industry and totals for each State will also be issued in the next few months.

To Build Research Addition

Dr. Wesley Minnis, director of research and development of the National Aniline Division, Allied Chemical & Dye Corp., New York, N. Y., has announced plans for erection of an addition to its Research-Engineering Center located at the Buffalo, N. Y. plant. This new building will provide increased space for application research on diisocyanates which are being produced by National Aniline Division for sale under the trade name of "Nacconates". Expansion of research on commercial applications for diisocyanates is necessary to provide the best information to National Aniline's customers with respect to new and better uses for these important compounds. Currently work is continuing on uses such as in flexible and rigid polyurethane foams, as well as in rubber, protective coatings, adhesives, textile, paper and leather treatment. The company's new plant for producing the "Nacconates" is now nearing completion in Moundsville, West Va. This will provide large-scale facilities for production of the diisocyanates. The new addition for application research will be a one story structure providing approximately ten thousand square feet of floor space. It is expected to be completed for occupancy by late 1956.

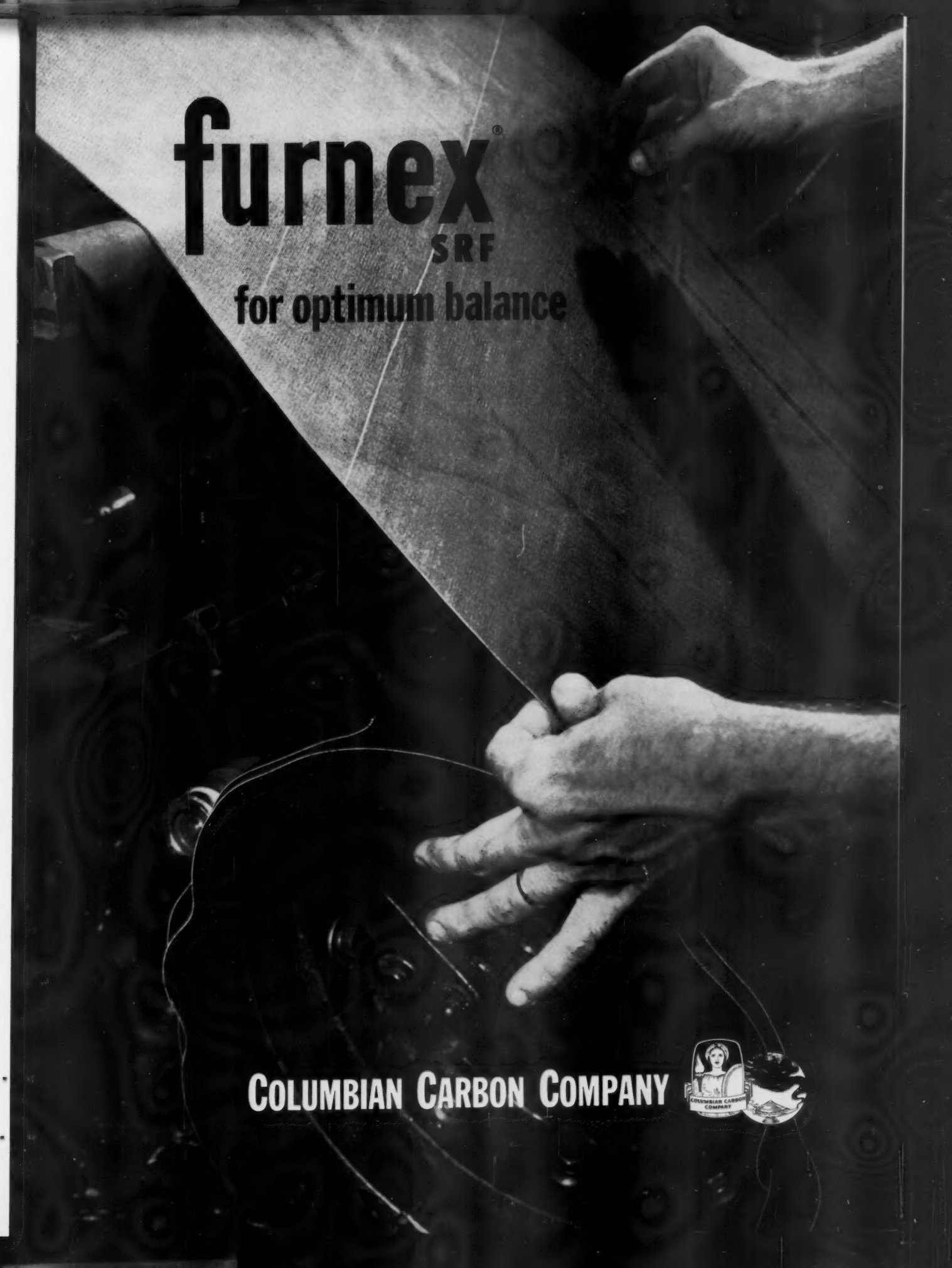
Weidlein Announces Retirement

Dr. Edward R. Weidlein, president of the Mellon Institute of Industrial Research, Pittsburgh, Penna., since 1951, announced his retirement effective March 31 at a special testimonial dinner tendered in his honor on March 19 in Pittsburgh. Dr. Weidlein has been prominently and actively identified with the Institute for over 40 years, serving as a senior fellow, 1912-16, and then as an executive staff member from 1916-51, when he was named president. Dr. Weidlein is noted internationally as a scientist, research administrator and author. During World War II, Dr. Weidlein held a number of wartime and governmental positions. He was technical advisor to the Rubber Reserve Co. and the Synthetic Rubber Division of the Federal Facilities Corp. He is recognized as a leader in the development of the American synthetic rubber industry. Dr. Weidlein will remain on the Board of Trustees of the Institute and will be available in an advisory capacity in the administration of the Institute's research program. His successor as head of the Institute's research executive staff will be announced later on.

G-E Names New Distributor

Harwick Standard Chemical Co. has been named a distributor for silicone mold release agents and anti-foam materials made by the Silicone Products Department of the General Electric Co. Harwick will be the distributor of "SM-55", "SM-61", and "SF-96" (300), used in rubber and plastic molding and finishing operations, in Alabama, Florida, Georgia, Mississippi, and Tennessee. Harwick will also distribute "Anti-Foam 60" and "SS-66" in this area.

An index to Volume 78 of RUBBER AGE will be found on Pages 183 to 186 of this issue.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King Retirement Announced

F. G. W. King

F. G. W. King, technical director of the Dunlop Rubber Co., Ltd., Fort Dunlop, England, for the past 20 years, has announced his retirement. A graduate of the University of Wales, Mr. King joined the Fort Dunlop technical department after service with the Royal Air Force in World War I. In 1930, he was named manager of the tire design division and in 1935 he was named technical director. Mr. King was a member of many of the wartime committees dealing with tires. He was also a member of the Tire Manufacturers' Conference Production Group and Factory Advisory Committee. After the war, he was closely associated with the establishment of the Dunlop Research Center, first as chairman of the committee which planned it and then as chairman of the Development and Research Board concerned with its central policy on research and development. Mr. King is vice-president of the Research Association of British Rubber Manufacturers; a member of the Research Committee of the Federation of British Industries; of the Council of the Tire Manufacturers' Conference; of the Board of Governors of the National College of Rubber Technology; and for two years he was a member of the High Polymers Committee of the Department of Scientific and Industrial Research. He is past-chairman of the Midland Section of the Institution of the Rubber Industry and for a few years was a member of its Council.

Goodrich Promotes Jansen

Dr. Jacob E. Jansen, with the B. F. Goodrich Co. since 1938, has been named director of organic chemicals research in the company's Research Center, Brecksville, Ohio. Dr. Jansen, a native of Iowa, is a graduate in chemistry from Carlton College, Minn., and earned his doctor's degree in organic chemistry at Harvard University. He joined Goodrich as a research chemist in 1938, held a number of key positions on the company's research staff and was manager of polymer chemical research at the time of his new assignment which he assumed on March 1. He is the holder of a number of patents and the author of numerous technical articles and scientific papers. He is a member of the A. C. S.

Papers Deadline Set

The Division of Rubber Chemistry of the American Chemical Society announces that abstracts of papers to be presented at the meeting on September 19-21 at Atlantic City must be in the hands of the Secretary by July 6. Abstracts should be about 200 words long and should be submitted in triplicate to: A. M. Neal, E. I. du Pont de Nemours & Co., Inc., P.O. Box 406, Wilmington, Del.

To Build Polyethylene Plant

Koppers Co., Inc., will join Brea Chemicals, Inc., in the construction and operation of a new polyethylene plant costing more than $10,000,000. Construction of the plant, in Los Angeles County, Calif., will start immediately. It is expected to be in operation by mid-1957, with an ultimate capacity of 60,000,000 pounds per year. Uuder a contract between the two companies, Brea, a subsidiary of Union Oil of California, will operate the plant with technical assistance by Koppers' Chemical Division. The plant will produce a new rigid-type polyethylene under a licensed low-pressure process. Koppers is already producing the material in semi-commercial quantities under the name of "Super Dylan" polyethylene at its own plant in Kobuta, Penna., and is erecting another plant for this purpose in New Jersey. The refinery gas for the manufacture of ethylene will be supplied through pipelines from Union Oil's Los Angeles refinery.

Expanding Carbon Black Plant

Columbian Carbon Co., New York, N. Y., will add a unit with 20,000,000-pounds annual capacity to its carbon black plant at North Bend, La., in order to achieve greater flexibility in production. A second unit of equal capacity is under consideration. Construction of the first unit will be started within the next few months. The rubber industry's demands for an increasing variety of carbon black grades make this action advisable in spite of below-capacity operations at many plants of the carbon black industry, the company states.

RMA Type Descriptions Amended

Rubber Manufacturers Association, Inc., New York, N. Y., has published Amendment II to its Type Descriptions and Packing Specifications for Natural Rubber. Effective March 1, 1956, the amendment provides a third alternative method of packing Flat Bark Crepe. The new specification permits the use of No. 1, 2, 3 or 4 Thin Brown Crepes as wrapper sheets for Flat Bark bales. Amendment II has been endorsed by the Rubber Trade Association of New York.

A four-page illustrated data sheet on its line of industrial fire hose has been published by the B. F. Goodrich Co. Industrial Products Division, Akron, Ohio.

Sauer Named Vice-President

Dr. Robert O. Sauer

Dr. Robert O. Sauer, formerly engaged in development engineering work for the General Electric Co. at Waterford, N. Y., has been appointed vice-president in charge of research and development at the Velsicol Chemical Corp., Chicago, Ill. At General Electric, Dr. Sauer had been manager-engineering and manager of advance and development engineering with the Silicone Products Department. Dr. Sauer received his doctorate degree in organic chemistry at the University of Illinois. He is presently a member of the American Management Association, American Chemical Society, and Alpha Chi Sigma, national professional chemical fraternity. Velsicol's manufacturing units at Marshall, Illinois, and Memphis, Tenn., produce technical chlordane, heptachlor and endrin. Other products include industrial resins, solvents, saturants, chlorine, caustic soda and benzol.

Appointments at Ansonia Wire

Ansonia Wire & Cable Co., Ansonia, Conn., has announced two changes in its Engineering Department. Hugo W. Biskeborn has been appointed chief engineer. Since joining the company in 1954, he has been cable research engineer. Mr. Biskeborn has a long and successful background in both power and communication cable engineering. Victor Siegfried has been appointed power cable engineer, and will be responsible for coordinating and developing the engineering of plastic insulated wire and cable for power uses. Mr. Siegfried, a graduate of Stanford University, and past vice-president and director of A.I.E.E., was formerly chief research engineer of the Electric Cable Works of American Steel and Wire Co.

Considering Merger Proposal

West End Chemical Co. and the Stauffer Chemical Co. have announced that representatives of their boards of directors are giving active consideration to a proposal for merger of West End Chemical with Stauffer. Under the terms of the proposal it is contemplated that West End will continue to operate under its present management as an autonomous division of Stauffer.

Firestone Supreme Tubeless Tire

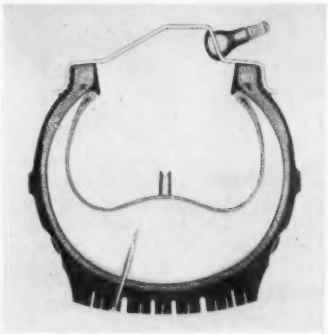
A new tubeless tire designed to provide motorists with complete tire safety and peace of mind under modern super-highway driving conditions has been announced as the "safest and longest-wearing passenger car tire ever offered to American motorists" by Lee R. Jackson, president of the Firestone Tire & Rubber Co., Akron, Ohio. In appearance, the tire is completely new and is said to be the first one ever to be styled with the help of large numbers of motorists through a scientifically conducted public preference poll. The new tubeless tire, which has been named the "Supreme", is made with a safety-tensioned and gum-dipped nylon cord that assures tremendous resistance to the impacts of hitting chuckholes, stones or other road hazards.

The new Supreme tire has a specially compounded gummy sealant that prevents tire failures from nails and similar objects. Blowout protection is assured by a specially contoured safety diaphragm which is made of two plies of rubberized nylon cord and an ingenious safety valve that automatically locks two thirds of the air into its inner air chamber when the outer casing of the tire is ripped open or slashed. With this air locked into the "tire within the tire", a motorist can bring his car to a safe, straight-line stop without danger of swerves or the complete loss of control that sometimes results from blowouts with ordinary tires. During inflation of the tire, and under normal driving conditions, the valve remains open to maintain equal pressure through all parts of the tire, the company declares.

The exclusive tread design of the Supreme tire is based on new engineering principles that give the tire a glide-like ride over rough and irregular roads. Tire squeal in turns and sudden stops has been virtually eliminated by the special design and the tire runs silently at any speed. Outstanding safety feature of the new tread design is the great increase in traction provided by the thousands of integral skid resistors. Running in a diagonal direction, they improve forward traction and guard against side skidding. Further improvement in the riding quality of the tire has been attained by designing a wide and deep tread.

Construction of the Supreme tire consists of four plies of rubberized nylon cord and specially compounded rubbers for each part of the tire. A special synthetic rubber is used on the inside of the tire because of its exceptional air retention qualities. A new cold rubber compounded with specially developed furnace blacks is used to make the tough top tread that gives greater mileage than any other tire. The white sidewall of the Supreme tire also contains new compounds of pigments, rubber and chemicals that will prevent discoloration and will protect it from the cracking or checking that can be caused by smog and ozone, Firestone states.

"How Thick Should a Rubber Roll Covering Be?" is the title of an Industrial Roll Engineering Report No. 8 available from the Rodney Hunt Machine Co., Orange, Mass.



This sectional view of the new Firestone Supreme tire illustrates how the gummy sealant prevents air leakage by clinging to a penetrating nail. It also shows how the diaphragm is contoured to protect it from puncturing nails. The valve in the center of the diaphragm automatically closes when the outer wall of the tire is broken or slashed and retains enough air in the inner chamber to keep the tire inflated and the car under control.

Ask Excise Tax Revisions

A subcommittee of the House Ways and Means Committee has recommended scores of changes in the Federal excise tax laws. The subcommittee has endorsed a recommendation for a simpler and more uniform system of exemptions and refunds for manufacturers' excise taxes and, where applicable, for other excises. However, the new exemption system would not apply to tires and tubes used on new cars and trucks because of the different tax rates involved between the component and final items. Instead, the subcommittee would retain the present system of allowing the auto or truck manufacturer a credit for some of the tax paid on the tires and tubes. This scheme would also be applied to the tires and tubes used on power lawn mowers, trailer dollies and other taxable items. Provision would be made to exempt from tax tires and tubes on vehicles that are exported or sold to local governments. The subcommittee also recommended an additional 1c a pound tax on tubeless tires. It is estimated that this tax would pick up $6,600,000 in the first year.

Named Chief Plant Engineer

William Duffy has been appointed chief plant engineer of the Stokes Molded Products Division of the Electric Storage Battery Co., Trenton, N. J. Formerly chief of building and field service of the Glenn L. Martin Co., Baltimore, Md., Mr. Duffy also has been a partner in a machine shop business in Tremont, Penna., and a supervising project engineer of Johnson & Johnson, New Brunswick, N. J. Mr. Duffy is a registered professional engineer with licenses in several states. He was graduated from Drexel Institute of Technology, Philadelphia, Penna., in 1943, with honors in mechanical engineering. A native of Philadelphia, Mr. Duffy will move to the Trenton area, shortly.

Two New Barrett Offices

Two new Barrett Division district offices, one in New York City, the other in Detroit, have just been established and district managers appointed to handle the rapidly expanding markets for the company's line of "Plaskon" industrial resins, according to an announcement by Carleton Ellis, Jr., director of plastics and resins sales, Barrett Division, Allied Chemical & Dye Corp., New York, N. Y. The new offices will provide improved customer sales and service for Plaskon polyester resins, for laminates, polyurethane foams, and premix moldings, glues and adhesives, foundry resins, paper treating resins, and phenolic resins.

The Eastern District Office, to be located in New York City, will service sales territories in the New England States, Middle Atlantic States, West Virginia, and Eastern Ohio. It will be under the direction of newly appointed district manager, W. H. Hough, formerly sales representative for the Barrett Industrial Resins Department. The Detroit office will serve the Midwestern and Southwestern districts including Kentucky, Michigan, and Western Ohio west to the Dakotas and south to Texas including the Mississippi Valley. It will be under the direction of newly appointed district manager, J. N. Grove, until now Barrett special representative for Plaskon polyester resins and oils. The two new Barrett offices will supplement the company's recently established Southern District office in Greensboro, N. C., under district manager, R. W. Burdeshaw.

Nevastain A Antioxidant

Neville Chemical Co., Pittsburgh, Penna., has introduced "Nevastain A", said to be an excellent non-staining, non-discoloring antioxidant with low volatility and good stability. It is reported that synthetic and natural rubber compounds using Nevastain A have superior physical characteristics over those containing competitive non-staining antioxidants. Neville states that the new antioxidant is being produced on a plant scale and is readily available. A liquid, Nevastain A has a Gardner color of 9 maximum, and a specific gravity of 1.08 to 1.09 at 30°C. It is soluble in a great many materials, including the aliphatics, aromatics, benzene, carbon tetrachloride, dioxane, gasoline, toluene, xylene, etc. It is insoluble in water.

Retires From Dunlopillo

A pioneer of the world industry of latex foam manufacture, Leonard Harral, has retired from his directorship of the Dunlopillo Division of the Dunlop Rubber Co., Ltd., at Walton, England. In the early 1930's, Mr. Harral began selling Dunlopillo and he has watched it grow in popularity at home and abroad until, within a couple of decades, its sales topped £1,000,000 a year. Dunlop now has twelve plants at home and abroad manufacturing Dunlopillo. When the British Latex Foam Manufacturers' Association was formed six years ago Mr. Harral was its first chairman, an office which he continues to hold.

L. P. Thies Named to New Post

Lawrence P. Thies

Lawrence P. Thies has been assigned to the Cleveland district as a special representative of the Chemical Division of the Goodyear Tire and Rubber Co., Akron, Ohio, according to C. O. McNeer, general sales manager of the division. In his new assignment, Mr. Thies will handle primarily sales of "Pliovic" vinyl resins and "Plio-Tuf" high impact plastic resins. He will service the growing plastics industry in Ohio, western Pennsylvania and eastern Michigan. Mr. Thies brings several years of sales experience in the chemical industry to his new position. He is a graduate of Kent State University with a bachelor of science degree and also holds a master's degree in business administration from Indiana University. He is a member of the American Chemical Society and the Society of Plastics Engineers.

Indiana Standard to Consolidate

Standard Oil Co., (Indiana) has disclosed plans for a major program of corporate simplification under which nine of its wholly-owned subsidiaries will be consolidated into four. It was stated that the proposals will become effective at the end of this year. As now planned, the consolidations will be: (1) Indoil Chemical Co., Pan American Chemicals Corp., and Hidalgo Chemical Co. will be combined into a single company, probably with a new name; (2) Pan American Production Co. will be merged into Stanolind Oil and Gas Co.; (3) American Oil Pipe Line Co. will be consolidated into Service Pipe Line Co., and (4) Pan-Am Southern Corp. will be consolidated into American Oil Co. Subsidiary crude oil purchasing activities will be taken on by Stanolind Oil Purchasing Co.

Gresham Leaves Goodrich

Dr. Thomas L. Gresham, director of organic chemicals and engineering research for the B. F. Goodrich Co., Akron, Ohio, has resigned to become vice-president in charge of research at the A. C. Staley Manufacturing Co. Dr. Gresham has been with Goodrich since 1937. At A. C. Staley, he will be in charge of research and development on corn and soybean processing.

Appointed Development Manager

John J. Hartz has been appointed development manager for all tire manufacturing divisions of the Goodyear Tire & Rubber Co. In his new assignment, Mr. Hartz will oversee all phases of the company's tire development and compounding programs, with direct responsibility to W. J. Lee, director of engineering, tire development. An assistant to Mr. Lee since May of last year, Mr. Hartz has more than 27 years of tire engineering experience. During his lengthy Goodyear career, Mr. Hartz has devoted more than 16 years to the development of compounds for tires, tubes and accessories, as well as for various other products manufactured by the company. Six of these years were spent in managerial capacities. In 1951, he was assigned by the company to handle all production at its Japanese subsidiary at Kurume. He was recalled to Akron in 1953 as manager of tire compounding, a position he held until last year when he was named to assist Mr. Lee. Mr. Hartz was graduated from the Massachusetts Institute of Technology in 1929 with a bachelor of science degree in chemical engineering.

Promoted to Plant Manager

Robert N. Rylands, Akron, Ohio, has been promoted to production manager at Plant 3 of the B. F. Goodrich Chemical Co. in Akron, Ohio. He succeeds Charles Cooper who was recently named plant manager. Mr. Rylands, a native of Cicero, Ill., received a B.S. degree in chemical engineering from the University of Illinois in 1941. Shortly thereafter he joined Goodrich in Akron as a chemical engineer in the Raw Materials Department. In 1942, he was assigned to Plant 3 as a shift engineer and later as a shift foreman. In 1949, Mr. Rylands was promoted to general foreman in the Hycar American rubber plant and in 1950 he became general foreman of the chemical production plant, a position he retained until his present appointment. Mr. Rylands is a member of the American Institute of Chemical Engineers.

Rubarite Moves Offices

The new offices of Rubarite, Inc., are now located at 1702 Philtower Building, Tulsa, Okla., according to an announcement from the firm's joint owners, the Goodyear Tire & Rubber Co., the National Lead Co. of New York, and Bird and Son, Inc., of East Walpole, Mass. Company offices formerly were located in the Board of Trade Building, Chicago, Ill. Emil R. Albert, Jr., president and general manager, and Col. Walter F. Winters, chief engineer, will be located at the new offices in Tulsa. The firm's manufacturing plant is located at Malvern, Ark. The firm produces a rubber additive used in asphalt and tar for road building operations, air strips and miscellaneous applications, including fiber glass insulation, water proofing, undercoating of automobiles and roofing.

Need a personal file of RUBBER AGE? Use the handy coupon provided on page 175.

To Head Boston Office

Alfred Ohlander

Alfred Ohlander, formerly pigment sales representative for the Chicago, Ill., office of the New Jersey Zinc Co., New York, N. Y., has been placed in charge of the company's sales office in Boston, Mass. Mr. Ohlander has had many years' experience in pigment sales work, having represented the company's interests in the rubber, paint and other zinc pigment consuming industries in the middle west since 1936. He started his employment with New Jersey Zinc in 1927.

Publishes Patent Notification

In a legal notice published recently, the Barnes Corp., called attention to U. S. Patent No. 2,737,422, issued March 6, 1956, to J. H. Barnes. This patent covers the portable rubber tire trim member manufactured by the Bearfoot Sole Co., Inc., of Wadsworth, Ohio, under exclusive manufacturing license agreement from the Barnes Corp. It is stated that authorized brands manufactured under this patent are: Port-A-Wall, Flex-A-Wall, Fiesta, Color Guard, and Color Sidewall. Barnes Corp. states that any persons making and/or selling sidewall trim members of the type covered in the patent are liable to the patent owners for damages for all trim members made or sold after the grant of said patent. The Barnes Corp. expects to take any and all action relating thereto in order to protect their rights under U. S. Patent law.

Kimmich Receives 40-Year Pin

E. G. Kimmich, chief engineer of the Industrial Products Division of the Goodyear Tire & Rubber Co., Akron, Ohio, was honored at special ceremonies held on March 1 at the Plant 2 cafeteria in Akron on his completion of 40 years of continuous service with the company. Approximately 300 friends and associates attended the ceremonies at which Mr. Kimmich was presented with a service emblem denoting his four decades of service. He also received several other gifts. Mr. Kimmich joined Goodyear in 1916 in the Industrial Products Division and has remained in that division since. Dr. R. P. Dinsmore, vice-president in charge of research and development, presided over the affair.

UC Silicone Rubber Compounds

Two new silicone rubber compounds which fabricators can use for rapid one-step thick section curing are now available in commercial quantities from the Union Carbide and Carbon Corp., New York, N. Y. Known as "K-1025" and "K-1028" silicone rubber compounds, they are prepared by the Silicones Division of the company, and come in neutral or red color. Designed for general purpose use, K-1025 and K-1028 meet or exceed Aeronautical Materials Specifications and specifications of the American Society for Testing Materials. Both compounds have very low compression set, important for example in making refrigerator door seals or kitchen oven door gaskets, or heat and cold-proof motor mounts. Moreover, since this property is inherent in the gum, no toxic additives are used in these compounds. Fabricators will be especially interested in the fact that these compounds can be used for rapid, one-step thick section curing with the new catalyst, di-tertiary-butyl peroxide (DTBP). Much time, trouble and expense can thereby be eliminated in building up rubber rolls or making moldings and extrusions for industrial purposes, the company states.

K-1025 is unexcelled for covering rolls, it is said. Often an initial steam cure with DTBP will develop better properties than can be obtained even after post-curing earlier types of compounds, according to Union Carbide rubber chemists. K-1028 is also excellent for covering rolls and has very good oil resistance. K-1025 has a 50 Durometer hardness; K-1028 has a hardness of 80. Compounds with intermediate hardnesses of 60 and 70 can be prepared by the fabricator by blending different quantities of K-1025 and K-1028, or may be ordered from Union Carbide as K-1026 and K-1027.

Fawcett Elected Mohawk President

Henry M. Fawcett has been elected president of the Mohawk Rubber Co., Akron, Ohio, succeeding Ray E. Bloch, president and general manager for the past twenty years. Mr. Fawcett formerly held the post of assistant to the president. Mr. Bloch has been elected chairman of the board. He has been with the company since the day it was founded forty-three years ago. He assumed the presidency in 1935. Other officers of the company were re-elected. They are Charles E. Sauvain, secretary and sales manager, and Harold J. True, assistant treasurer.

Ogden Named Plant Manager

Pennsylvania Salt Manufacturing Co., Philadelphia, Penna., has announced the appointment of Robert P. Ogden as plant manager of its Sharples Chemicals Division's Riverview works, one of Pennsalt's two major production units located in Michigan. Mr. Ogden joined the company as a chemical engineer after receiving his degree at Cornell University in 1941. He became assistant to Sharples, vice-president of manufacturing in 1943. Successive promotions led to his appointment as production manager in 1950, the position he held prior to his present assignment.

Rodney Hunt Names Karakas

Harry J. Karakas

Rodney Hunt Machine Co. of Orange, Mass., has announced the appointment of Harry J. Karakas to the position of manager of the Process Equipment Division. Mr. Karakas will be responsible for application, development, engineering and sales activities of the division. Produced by the division are the Rodney Hunt Turba-Film Evaporator and Rodney Hunt-Luwa Spray Dryer which are currently solving processing problems in a variety of industries such as rubber, chemicals, petrochemicals, petroleum products, pharmaceuticals, insecticides, fertilizers, foods and confectioneries. Mr. Karakas is a graduate of Rutgers University with a bachelor of science degree in chemical engineering. He is a member of the American Institute of Chemical Engineers and the American Chemical Society. Prior to his joining the Rodney Hunt Co., Mr. Karakas was director of Project Engineering Sales at the Pfaudler Co., Rochester, N.Y.

Borden Builds Chemical Plant

Borden Co., New York, N. Y., has started construction of a new polyvinyl chloride resin plant at Leominster, Mass. It is scheduled to be completed by June and will have an annual capacity of about 12,000,000 pounds. Augustine R. Marusi, president of Borden's Chemical Division, said the unit will adjoin the company's present unit on the site which produces polyvinyl alcohol and polyvinyl acetate. The new plant will produce a wide variety of specialty resins and vinyl chloride latices, as well as general purpose polyvinyl chloride for the calendering and extrusion field.

New Wellco-Ro-Search Affiliate

Wellco-Ro-Search, Waynesville, N. C., has announced the conclusion of an affiliated agreement with Fabrique Nationale de Chaussures, S.A., in Port-au-Prince, Haiti, for the manufacture of all types of Ro-Search footwear. The Haitian company is said to be the first firm in that country to manufacture any type of vulcanized rubber footwear. Moreover, it is said to be the first company to possess a rubber mill in the country. A daily production of approximately 2,000 pairs is foreseen and the first shoes have already been made.

Reports on Awards for Ideas

Firestone Tire & Rubber Co., Akron, Ohio, during 1956 expects to pass the million dollar mark in awards paid to employees for ideas for improvements in production, sales and office operations since the Firestone suggestion system was started in 1918. Awards have totaled well over $900,000, announced L. J. Alger, manager of the suggestion system for the company, in a year-end review. During the 37 years employees have submitted more than 183,000 suggestions and of these more than 57,000 have been adopted. From plants throughout the world and from the sales and office forces, the company is now receiving about 15,000 suggestions a year and putting into use 4,000—an adoption rate of about 27%. Rate of participation in the suggestion plan also is running high, with more than 400 suggestions being received each year per 1,000 employees—a participation rate of 40%. Awards now top $100,000 a year.

The suggestion system encourages employees to offer ideas for improving working conditions, quality, safety and sales, and for economizing on operations and on material usage. Amounts of awards for improved operations are in proportion to tangible yearly savings. Other awards are based upon intangible savings and benefits to workers in adding comfort and safety to their jobs. During 1955—the suggestion system's best year—Firestone employees received a total of $100,966.33 for 4,044 adopted suggestions—an average of nearly $25 per award.

Shell Chemical Assignments

The Synthetic Rubber Sales Division of the Shell Chemical Corp., has announced that J.E. "Bert" Toevs, sales manager, will leave the plant at Torrance, Calif., about May 1, 1956, to undertake a special assignment of about one year's duration in the company's Economic Research Department. His work will be concerned with forecasting and general planning in the synthetic rubber field. F. W. Hannsgen, manager of sales development, will add Mr. Toev's duties to his own during this period.

Reopens Clarksdale Plant

Cooper Tire & Rubber Co., Findlay, Ohio, has announced the reopening of its subsidiary manufacturing plant in Clarksdale, Miss. The plant closed in January pending the outcome of stock negotiations. The plant, which employs 80 to 100 persons, is operated as the Clarksdale Rubber Manufacturing Co., a subsidiary of Cooper Tire & Rubber Co. Cooper Tire first took over operation of the plant on August 16, 1955, and operated it under temporary lease until January, 1956.

NRM Buys New Plant

National Rubber Machinery Co., Akron, Ohio, has announced it has signed an agreement to purchase the former Crescent Machine Division plant of the Rockwell Manufacturing Co. at Leetonia, Ohio. The plant is close to the Columbiana plant of the Akron company and will provide space for expansion of its operations there.

Promoted to Plant Manager

Charles B. Cooper

Charles Boland Cooper has been named manager of Plant 3 of the B. F. Goodrich Chemical Co. in Akron, Ohio. Mr. Cooper succeeds Fred Hands who was recently promoted to manager of the Institute, West Va. synthetic rubber plant recently purchased by Goodrich-Gulf Chemicals, Inc. Mr. Cooper, formerly production manager at Plant 3, is a 1935 graduate of Alabama Polytechnic Institute where he received a B. S. degree in chemical engineering. He joined Goodrich in 1937 as a chemist in the control laboratory in Akron. In 1939, he became part of the polyvinyl chloride research program and in 1940 was a staff member of the polyvinyl chloride pilot plant. In 1941, Mr. Cooper became a junior engineer in the production department of Plant 3, later being named shift foreman and general foreman. In 1950 he was named production manager, a position he retained until his present appointment. Mr. Cooper is a member of the American Institute of Chemical Engineers.

Elected A. D. Little President

Raymond Stevens, vice-president of the Arthur D. Little Co., Cambridge, Mass., since 1930, has been elected president succeeding Dr. Earl P. Stevenson, who has been elected chairman of the board. Mr. Stevens has directed the expansion of the company's scientific activities into various pioneering fields such as operations research. In May, the American Institute of Chemists will present its Gold Medal to Mr. Stevens for his contribution to the "wider understanding of the essential procedures for the management and operation of industrial research."

Nickels Joins Faultless Rubber

R. W. Nickels, formerly general manager of the Sundries Division of the B. F. Goodrich Co., Akron, Ohio, has been appointed vice-president of the Faultless Rubber Co., Ashland, Ohio. In his new post, Mr. Nickels will help formulate policies and procedures in the administrative end of the business. This will include the coordination of the sales and merchandising divisions with the manufacturing division.

USAF Reports Rubber Tests

The Commerce Department's office of Technical Services has published the results of Air Force research on several commercial and experimental rubber compounds tested in contact with newly developed hydraulic fluids. The Air Force said the tests — generally unsuccessful — indicated that present elastomer compounds are incapable of service in the new fluids for more than 48 hours at 400°F. Some acrylic rubber compounds showed promise up to 550°, but aged elongations are so low that their usefulness is limited. Others of the blended acrylic types showed a fair balance of properties after aging. The addition of plasticizers to certain rubber compounds was found by the Air Force to do little for low-temperature qualities and was detrimental in aging. While a compound suitable for fabrication into seals, hose, gaskets, and other components has not been found, the search will continue, the Air Force said. For piloted, supersonic craft a rubber is needed for long-term use over the range of —65° to 400°F.

Alco-Rainbow Merger Planned

Plans for merging the Alco Oil & Chemical Corp. of Phila., Penna., and Rainbow Production Corp. of Cleveland, Ohio, with combined assets of more than $2,500,000, have been announced by William H. Coleman, chairman of Alco, and Frank E. Taplin, chairman of Rainbow. Under terms of the consolidation, Alco stockholders will receive a total of 2,151,000 shares of Rainbow Production, or approximately 80% of the capital of the combined corporation. The remaining 537,653 shares of the then outstanding capital stock will be held by current shareholders of Rainbow Production. The resulting company will be named Alco Oil & Chemical Corp. (Ohio). The agreement has been recommended by the boards of directors of each company and was approved by Alco stockholders. Rainbow's shareholders also voted approval on March 30. Alco Oil & Chemical is a producer of latex chemicals. Rainbow Production produces crude oil in Illinois and Kentucky.

Davis Appeals Court Decision

Poncet Davis, president of the Robbins Tire & Rubber Co. of Tuscumbia, Ala., has asked the U. S. Supreme Court to reconsider its action of February 27 when it refused to hear his complaint against the Cleveland District Court which tried him and the Cincinnati Circuit Court which upheld his conviction on a charge of failing to pay $738,249 in income taxes. Unless the Supreme Court changes its previous stand, Mr. Davis will go to prison in late April to begin a five year term. He has also been fined $40,000.

Meanwhile, a Federal Judge in San Francisco, Calif., has turned down a $1,100,000 breach of trust suit filed by Robbins Tire against two California companies and four individuals. The suit centered around the sale of assets of the Pacific Rubber Co. of Oakland, Calif., to the Bay Rubber Co. of Los Angeles. Attorneys for Mr. Davis stated that this decision will be appealed.

New Assignment for Nadherny

Ferd Nadherny

Owen J. Brown, Jr., vice-president and director of sales for Godfrey L. Cabot, Inc., Boston, Mass., has announced the appointment of Ferd Nadherny as his assistant with headquarters in Boston. Mr. Nadherny was formerly Cabot assistant regional sales manager in Akron, Ohio. He joined the Cabot organization as a sales trainee in July, 1952, and completed his indoctrination period in the company's southwestern plant and laboratory operations in February, 1953. He was then sent to Akron as a sales representative, and in August, 1955, was made assistant regional sales manager there. Mr. Nadherny was graduated from Yale University in 1950 with an A. B. degree, and from the Harvard Graduate School of Business Administration in July, 1952, with an M. B. A. degree. He is a member of the American Chemical Society.

1956 TLARGI Yearbook Out

The Los Angeles Rubber Group, Inc. (TLARGI) has announced publication of the 1956 edition of the "TLARGI Yearbook". As usual, the Yearbook recapitulates group activities during the preceding year. Also presented are the technical papers which featured meetings throughout the year. A complete listing of rubber manufacturers and their principal products is presented as is a listing of suppliers to the rubber industry situated on the West Coast. The 102-page yearbook also contains a complete membership list of the Los Angeles Rubber Group and much other pertinent information. Copies may be obtained by writing to the Chairman, Yearbook Committee, the Los Angeles Rubber Group, Inc., c/o Statler Hotel, Wilshire at Figueroa, Los Angeles, Calif.

Goodyear Chemical Review

The Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has begun publication of a new organ, the "Goodyear Chemical Review." Volume 1, Number 1 of the new publication, to be issued quarterly, covers the first three months of 1956. The review contains articles of general interest about Chemical Division activities and products.

Names in the News

W. A. PATTERSON, president of United Air Lines, has been elected a director of the Goodyear Tire & Rubber Co.

JOHN C. MACKINNON, associated with the Hood Rubber Co., a division of the B. F. Goodrich Co., for twenty-seven years, has been appointed manager of footwear.

GEORGE M. WALKER has been elected executive vice-president of the Koppers Co., and CARL H. POTTENGER has been appointed a vice-president and assistant general manager of the Chemical Division. B. J. C. VAN DER HOEVEN has been named general manager of the Chemical Division succeeding Mr. Walker.

WILLIAM B. WIEGAND, director and research consultant of the Columbian Carbon Co., was recently awarded the degree of master of arts by the Department of Greek and Latin of Columbia University.

AUSTIN KUHNS, associated with the Farrel-Birmingham organization since 1922, has been elected senior vice-president of the company.

HOWARD SMITH, associated with the Union Carbide organization since 1925, has been named assistant general sales manager of the Bakelite Co., a Union Carbide division.

ARTHUR C. TREECE, associated with the General Electric Co. since 1922, has been appointed general manager of the Plastics Department.

ALEXANDER D. LUMSDEN, formerly a district sales representative for the Foam Products Division of Hewitt-Robins, Inc., has been appointed manager of foam slab product sales.

R. D. GLENN, associated with the Carbide and Carbon Chemicals Co. since 1934, has been appointed assistant works manager for the company.

PHIL GLANZER, Canadian news correspondent for RUBBER AGE, has been nominated as a representative to the Public Accountants Council of Ontario by the Independent Accountants Society.

DAVID KETNER, formerly advertising director of the International Latex Corp., has been appointed vice-president in charge of advertising. HAROLD RUDOMINER, formerly national sales manager of the Family Products Division, has been named vice-president in charge of sales for the division.

FRANK FROWELL, until recently associated with the Dewey & Almy Chemical Co., has joined the National Electric Products Corp. at Ambridge, Penna.

THEODORE P. MALINOWSKI, formerly associated with the Monsanto Chemical Co., has joined the Atlas Powder Co. as development manager in the Product Development Department.

J. T. KIDNEY, manager of the Employees Service Division at the Goodyear Tire & Rubber Co., was named "Safety Man of the Year" at the thirteenth annual Greater Akron Safety Conference held recently in Akron, Ohio.

EDWARD MADDEN has been appointed a vice-president of the International Latex Corp., Dover, Del. Mr. Madden formerly served as a vice-president of Motion Pictures for Television, Inc., the National Broadcasting Co., and McCann-Erickson, Inc.

R. C. BOLTZ and J. R. HULTEN have been appointed division managers and H. P. WHITE has been appointed assistant division manager for the Carbide and Carbon Chemicals Co.

ROBERT S. HOLDSWORTH, formerly associated with the Naugatuck Chemical Division of U.S. Rubber, has joined the staff of the Research Division of the National Research Corp.

WILLIAM C. WEIRATH, formerly manager of Kraft sales and service for the General Tire & Rubber Co., has been named assistant manager of commercial sales for the company.

DR. JOGINDER LAL has joined the Diene Synthetic Rubbers Section of the Research Division of the Goodyear Tire & Rubber Co.

ARTHUR R. CUTCLIFF has joined the staff of the Parker Appliance Co., Cleveland, Ohio, as sales engineer for O-rings and related molded rubber parts.

CARLYLE W. GILBERT, associated with the Blaw-Knox Co. since 1951, has been named manager of the Resins and Plastics Department.

R. L. DUNCAN, F. J. RAUSCHER, and E. R. YOUNG have been appointed assistant sales managers for the Carbide and Carbon Chemicals Co.

ROBERT U. HASLANGER has been elected vice-president and general manager of Escambia Bay Chemical Corp. He was formerly associated with Stauffer Chemical.

LOUIS MILLER SHERMAN, formerly associated with the Ethyl Corp., has joined the Thiokol Chemical Corp. as manager of market development.

H. F. VAN VALKENBURGH, vice-president of the Dunlop Tire & Rubber Corp., recently celebrated his completion of 35 years with the company.

R. E. CHAMPE, formerly associated with the U. S. Rubber Co., has joined the Automotive Rubber Co., Detroit, Mich., as sales and cost analyst.

JOHN G. PHILLIPS, vice-chairman of the board of the International Business Machines Corp., has been elected a director of the Okonite Co.

DR. HERBERT E. SILCOX, associated with Merck & Co. since 1942, has been appointed to the new position of technical director.

HOWARD D. HERBERT has been elected vice-president in charge of Mirafoam Industrial Sales, Inc., a sales division of the American Foam Rubber Corp., Burlington, N. J.

LARRY JACOBSON has been promoted to staff assistant, calcium carbonate sales, in the silicate, detergent, calcium division of the Diamond Alkali Co.

DR. H. A. DAYNES has been appointed Foundation Lecturer for 1956 by the Council of the Institution of the Rubber Industry and will deliver a lecture on "Trends in Electric Cables made from Rubber and Plastics" on May 10 in London.

FORREST E. PHILLIPS has been promoted to the position of sales manager of the Phenolic Molding Compound Department, Synvar Corp., Wilmington, Del.

ALEXANDER G. KOOS, formerly associated with the Diamond Alkali Co., has joined the Plastics Division of the Celanese Corp. of America as a member of its sales development department staff.

BRAYTON H. SLADE, formerly treasurer of the American Overseas Finance Corp., has been elected treasurer of the Thermoid Co.

KENNETH R. HUFFMAN, associated with the B. F. Goodrich Co. since 1919, has been appointed assistant controller of the firm.

FRED L. HOPPER has been appointed to the newly-created position of director of tire production planning and distribution of the Firestone Tire & Rubber Co. He has been with the concern since 1933.

JAY COOKE, a partner in the Philadelphia, Penna., investment counsel firm of Cooke and Bieler, has been elected a director of Hewitt-Robins, Inc.

TED BOGOSIAN, until recently chief chemist at the Davidson Rubber Co., has joined the Research and Engineering Center of the Johns-Manville Corp. at Manville, N. J.

RAE M. BROKER, associated with the Scovill Manufacturing Co. since 1951, has been appointed assistant sales manager, industrial hose coupling sales, Merchandise Division.

An index to Volume 78 of RUBBER AGE will be found on Pages 183 to 186 of this issue.

Joins American Hard Rubber

Dr. Albert H. Cooper has joined the American Hard Rubber Co., New York, N. Y., as assistant to W. M. Bergin, director of research and development. A well-known authority on organic and inorganic chemicals, Dr. Cooper will devote the major part of his time to furthering American's accelerated chemical research and allied production programs.

In his industrial career, he has specialized in process development and control, and in pilot plant operations for such organizations as the Aluminum Co. of America, E. I. du Pont de Nemours & Co., and U. S. Industrial Chemicals. He is the owner and manager of Pilot Engineering Co., industrial consultants on plant design and production problems. The author of many technical publications and a member of the leading professional societies in his field, Dr. Cooper has served on the faculties of North Carolina State College, Virginia Polytechnic Institute, University of Maryland, Bucknell University and Pratt Institute. He headed the Department of Chemical Engineering at Bucknell and currently heads this department at Pratt Institute. Dr. Cooper received his B.S. and M.S. degrees in chemical engineering from the University of Tennessee and his Ph.D. in chemical and mechanical engineering at Michigan State College. In addition, he has done graduate work at Massachusetts Institute of Technology and the University of Michigan.

Morris Rubber Formed

Morris Rubber, Inc., has been formed at 505 North La Salle St., Chicago 10, Ill., for the manufacture and fabrication of all types of sponge rubber. The company has purchased a 50,000 square foot building at Morris, Ill., and has installed complete facilities for the manufacture of sponge. The company proposes to enter the field of producing sponge rubber parts for industry in general and to customer's specifications. Morris Rubber will produce sponge rubber in stock forms for further fabrication. The company does not, however, propose to make a finished product under its own name for marketing to the consumer trade. Morris Rubber, Inc., is a wholly-owned subsidiary of the Backstay Welt Co., and has taken over all of the rubber business formerly conducted by the Union Welt Co., also a Backstay division. The company is now in production and within the next few months will employ approximately 200 persons.

Little Acquires Miner Labs

Arthur D. Little, Inc., Cambridge, Mass., has completed arrangements for the acquisition of Miner Laboratories, chemical consulting firm of Chicago, Ill. The merger took place on April 1. John R. Kirkpatrick, who established the ADL midwest office in 1952, will manage the new Midwest Division — Miner Laboratories. Dr. C. S. Miner, Jr., will continue to direct its technical operations, which will supplement ADL's main Cambridge laboratories in research for clients in the midwest.

Harwick Standard Promotes Behney

Dale F. Behney

Harwick Standard Chemical Co., Akron, Ohio, has announced the appointment of D. F. Behney as vice-president in charge of sales. The company has also announced the appointment of three new directors: Mr. Behney, James L. Weaver, Jr., and William L. Lasser. Mr. Behney joined the Harwick organization in 1950 as technical sales representative and was named general sales manager in 1951. Before joining Harwick, Mr. Behney had been purchasing agent for the Goodyear Synthetic Rubber Corp. and then buyer in the Chemical Division of the Goodyear Tire & Rubber Co. He is a member of the American Chemical Society, the Society of Plastics Engineers, and a Fellow of the American Institute of Chemists. He is a member of the Akron Rubber Group and its former chairman. Mr. Behney was graduated from North Carolina State College of Agriculture and Engineering in 1935 with a degree in chemical engineering. James L. Weaver, Jr., joined Harwick in 1947. As a director on the company board, he officially assumes the title of assistant treasurer. William L. Lasser joined the company in 1951. He now will act for the company in the field of chemical products procurement.

Acquires Spanish Interest

Monsanto Chemical Co., St. Louis, Mo., has acquired an equity interest in Etino-Quimica, S. A., Barcelona, Spain, a manufacturer of polyvinyl chloride, in exchange for machinery, equipment and technical aid. The equity interest was "less than 50%", and is not a controlling interest, a company spokesman said. Etino-Quimica was formed by Hidro-Nitro Espanola, S.A., Monzon, Spain, an electrochemical firm, and Aiscondel, S.A., Barcelona, Spain, a plastic-molding and calendering company. Monsanto Overseas will expand Etino-Quimica's polyvinyl chloride facilities and will build production facilities for producing polystyrene, the first such facilities in Spain. Work on both projects is now in progress. Sales and production of Etino-Quimica were not disclosed, but a spokesman said that the Spanish operation is comparable to that undertaken at its Monsanto Mexicana, S.A., subsidiary in Mexico.

ASRC to Increase Capacity

American Synthetic Rubber Corp., New York, N. Y., has announced that it will proceed immediately to increase the capacity of its plant at Louisville, Ky., by approximately 50%, raising its annual output to about 68,000 long tons. American Synthetic is owned by 28 companies which were formed into a group under the guidance of Thomas Robins, Jr., chairman of the board, to acquire one of the government-owned synthetic rubber facilities. The corporation took title to the Louisville copolymer plant on April 27, 1955. Mr. Robins is also president of Hewitt-Robins, Inc. In announcing the expansion, Bancroft W. Henderson, president of American Synthetic, predicted a continuing rise in the consumption of synthetic rubber. One of the reasons for expansion, he states, is to provide an additional source of supply to meet the increased demands expected from small business enterprises throughout the country, including many of American Synthetic's own stockholders. Work on the expansion will begin immediately, and it is expected that additional facilities will be in commercial operation in the first quarter of 1957.

United Carbon Elects Officers

Thomas A. Whelan, a co-founder of the United Carbon Co., Charleston, West Va., has been elected president of the company, and Sylvan C. Coleman, has been elected chairman of the board. Mr. Coleman, a partner in E. F. Hutton & Co., a brokerage firm, is also a director and a member of the Executive Committee of the company. Oscar Nelson, Jr., executive vice-president of United Carbon, has been named president of three operating subsidiaries: United Carbon Co., Inc., United Rubber & Chemical Co., and United Producing Co., Inc. Thorne Koblegard, who resigned from the presidency, remains on the board of directors and the Executive Committee. All other directors were also re-elected. Stockholders of United Carbon at their annual meeting approved a restricted stock option plan for executive and key employees.

Plans Ethylene Oxide Plant

General Aniline & Film Corp., New York, N. Y., has announced plans for the construction of a new ethylene oxide and ethylene glycol plant in Linden, N. J. The new facilities, which are expected to cost $8,000,000, will be located at the existing Dyestuff and Chemical Division plant in Linden, N. J. The ethylene oxide from the new plant will be used primarily in the production of the company's surfactants and detergents. The plant will have a capacity of 60,000,000 pounds of ethylene oxide a year.

To Acquire New Plant

The New Jersey Zinc Co., New York, N. Y., has concluded arrangements for the acquisition on May 1, 1956, of American Cyanamid Co.'s plant located at Gloucester City, N. J., where New Jersey Zinc plans to manufacture titanium dioxide pigments.

Financial News

GOODRICH NET SALES IN 1955 INCREASE 19.7% ABOVE 1954

According to the annual report issued by the B. F. Goodrich Co., Akron, Ohio, net sales in 1955 amounted to $755,016,879, compared with $630,670,600 in 1954, an increase of 19.7%. Direct and indirect sales to the federal government were 5.8% of total net sales for the year 1955, compared with 8.3% in 1954.

Net income amounted to $46,662,127, after provision for all costs, including taxes and depreciation. Net income for 1954, after provision for all costs, including taxes and depreciation, was $38,815,737. Net income was $5.26 a common share on the 8,871,068 shares outstanding on December 31, 1955. Net income a common share for the year 1954 amounted to $4.40 on 8,812,260 shares. The net sales and net income for the year 1954 included the new Sponge Products Division for the period from August 13, 1954, the date of acquisition, to December 31, 1954.

The earnings of associate companies in which Goodrich owns less than majority interests are included in the net income only to the extent of dividends received. Increases in Goodrich equities in net income retained by associate companies during the year are not included in net income and totaled $3,075,000 in 1955.

Federal and foreign income taxes for the year 1955 were $48,330,000 as compared with $36,474,000 in 1954. Total taxes in 1955 amounted to approximately $89,095,000, equivalent to $10.04 a share on 8,871,068 common shares, as compared with $74,208,000 in 1954, equal to $8.42 a share on 8,812,260 common shares.

Depreciation and Amortization

Depreciation and amortization of leasehold improvements in 1955 amounted to $19,677,643 as compared with $16,121,656 in 1954. The company, effective with the year 1954, has adopted methods permitted by the Revenue Act of 1954 for more rapid depreciation of new capital facilities acquired after December 31, 1953.

Capital and investment outlays by Goodrich during 1955 for expansion and betterment of manufacturing, distribution, and research facilities of the company, and investments in associate companies, amounted to $30,294,000. Capital and investment outlays during 1954 were $44,857,000.

Accruals for estimated expenses, under a provision of the Revenue Act of 1954, were reflected in the company's 1954 accounts and taken for tax purposes as permitted by the Act, resulting in an increase in 1954 net income of $1,035,000. This provision of the Code was repealed retroactively in 1955. Tax reserves were adequate to cover the additional tax imposed by the repeal.

Dividends totaled $1.90 a share in the year 1955, which compares with $1.60 a share in 1954. Total dividend payments to stockholders were $16,803,002 in 1955 and $13,771,865 in 1954. Dividends in 1955 reflect the company's practice in recent years of financing requirements for continued expansion and growth from earnings retained in the business.

Current assets at the end of 1955 were $350,626,130 and current liabilities were $109,474,023, a ratio of 3.2 to 1. Net working capital increased from $225,632,754 to $241,152,107 during the year.

Inventories at year end amounted to $147,345,672 compared with $121,574,285 at the end of 1954. Domestic inventories of man-made and crude rubber and rubber-like materials have been priced on the last-in, first-out (LIFO) basis in both years. Employment costs (salaries, wages, and employee benefits) in inventory were priced on the last-in, first-out (LIFO) basis in 1954. The last-in, first-out basis with respect to employment costs was disallowed by the Internal Revenue Service during 1955 and has been abandoned. Other inventories have been priced at the lower of cost or market.

Business Outside the U.S.

Net assets employed for the conduct of business outside the United States on December 31, 1955, amounted to $30,804,000 of which $14,859,000 was in Canada. Of the total amount $19,440,000 applied to net current assets and $11,364,000 to net fixed and other assets. Investments in companies located outside the United States in which the company owns minority stock interests are carried at original cost or lower.

Land, buildings, machinery, equipment, and leasehold improvements are stated at cost and, after retirements of fully depreciated facilities, amounted to $277,624,839 at the end of 1955 and $264,600,795 at the end of 1954.

Accumulated depreciation, obsolescence, and amortization increased to $139,421,837 by the end of 1955 from $126,409,877 on December 31, 1954. The percentage of this amount to total fixed property, at cost, was 50.2% at the end of 1955 and 47.8% a year earlier.

Regular sinking fund retirements of $1,768,000 were made on the 2¾% First Mortgage Bonds. Also purchased in 1955 were $1,375,000 of 3¾% first mortgage bonds to satisfy 1956 retirements.

Collyer Insulated Wire Co.

For 1955: Net income of $798,081, which is equal to $5.32 a share, compared with $965,384, or $6.44 a common share, in the preceding year.

Brown Rubber Co.

For 1955: Net income of $733,628, which is equal to $1.94 a share, compared with $521,155, or $1.38 a share, in the preceding year.

HEWITT-ROBINS SALES IN 1955 ESTABLISH NEW COMPANY RECORD

Sales of Hewitt-Robins, Inc., Stamford, Conn., set a new record of $47,132,792 in 1955, an increase of 32% over 1954's sales of $35,588,613, according to the company's annual report to stockholders issued by Thomas Robins, Jr., chairman and president. Net profit after taxes set a new high level of $1,338,854, or $4.21 a share on the common stock, compared with net profit in 1954 of $857,596, or $2.82 a share. Earnings before taxes were $2,621,781, compared with $1,032,721 in 1954, the report states.

In a statement given to the press concurrent with release of the report, Mr. Robins said the backlog of orders for most major products is currently at an all-time high. He said business has been improving steadily since the middle of 1955 and the prospects for 1956 are "extremely favorable."

"Barring a serious decline in business later in the year—which we see no reason to anticipate—sales should exceed $50 million for the full year," he said. "Earnings should be higher as a result of the increased sales and improved operations in several of the company's recently acquired plants."

About two-thirds of the total sales in 1955 were in the industrial category—conveyor belting, hose, conveyor machinery, conveyor engineering services, vibrating machinery and power transmission equipment. The other third came from the consumer products divisions—foam rubber and flooring products, the latter consisting chiefly of rubber and plastic floor tile and sponge rubber carpet underlay.

The report said Hewitt-Robins is now the largest rubber company outside the tire field and also the largest maker of belt conveyor equipment. Long-range plans are to continue to expand in rubber and plastics, and also to increase and diversify operations in machinery lines, particularly those closely related to materials handling and power transmission, it was stated.

Non-Tire Segment Growth

Mr. Robins told the stockholders about a recent statistical study made by the company which showed that the "non-tire" segment of the rubber industry is growing faster than the tire business. He said the survey showed that "non-tire" products currently account for about 53% of the rubber industry's dollar volume and he expressed the belief that the proportion may increase to two-thirds in the next 10 years.

The company's net working capital at the year-end was $10,672,219, compared with $9,903,614 at December 31, 1954. Cash on hand amounted to $1,114,013, compared with $1,489,401 at the end of 1954. Wages, salaries and employee benefits for the year amounted to $15,982,311, compared with $12,712,176 in the previous year. The cost of materials, supplies and services was $27,789,374, compared with $21,416,092 in 1954.

Have some comments to make? Write a letter to the editor! (See page 14).

Farrel-Birmingham Co.

For 1955: Net income of $1,320,386, which is equal to $4.13 per share, compared with $2,646,913, or $8.14 a share, in the preceding year. The reduced earnings in 1955 are a direct consequence of flood damages suffered by the company in 1955 plus the loss of production from facilities which were temporarily put out of commission by these disasters. Net sales in 1955 amounted to $37,852,235, against $40,260,238 in 1954.

Mohawk Rubber Co.

For 1955: Net income of $321,068, which is equal to $2.27 a share, compared with a net loss of $646,522 in 1954 after a tax credit of $700,971. Net sales in 1955 amounted to $14,330,371, against $8,864,762 in the preceding year. As of December 31, 1955, the company had total current assets of $4,824,296, and total current liabilities of $1,669,382.

O'Sullivan Rubber Corp.

For 1955: Net loss of $26,000, compared with a net income of $49,410 in the previous year. Vincent A. Catozella, chairman and president, attributed the loss in 1955 to depressed selling prices in relation to costs. Price adjustments effected in the latter part of the year are expected to be reflected in operating results in the early months of 1956.

Phillips Petroleum Co.

For 1955: Net income of $95,203,057, which is equal to $5.55 per share, contrasted with $76,234,679, or $5.20 per share in 1954. It is to be noted that the 1955 share earnings are based upon 2,489,667 more shares than existed in the preceding year. Gross income in 1955 was $913,313,888, against $796,129,752 in 1954.

Mansfield Tire & Rubber Co.

For 1955: Net income of $1,768,203, which is equal to $3.00 per common share, compared with $890,485, or $1.61 per common share, in the preceding year. Sales in 1955 at $74,555,659 set an all-time record for the company, 48% above the $50,378,302 recorded in 1954. Net income in 1955 was 99% greater than in 1954.

Lee Rubber & Tire Corp.

Quarter to January 31: Net income of $312,795, which is equal to 37c a share, compared with $315,718, also equal to 37c a share, in the corresponding quarter of the preceding year. Net sales in the quarter ended January 31, 1956, amounted to $10,845,626, against $9,870,830 in the quarter ended January 31, 1955.

Dayton Rubber Co.

Quarter to January 31: Net income of $435,833, which is equal to 60c a common share, compared with $416,671, or 67c a share, in the corresponding quarter of the preceding year. Net sales in the quarter ended January 31, 1956, amounted to $14,740,680, against $14,252,951 in the quarter ended January 31, 1955.

FINANCIAL BRIEFS

Roger S. Firestone, president of the Firestone Plastics Co., and a director of the Firestone Tire & Rubber Co., has made gifts of 5,610 common shares of Firestone Tire stock, reducing his direct holdings to 87,905 shares.

Edward Lamb Enterprises, Inc., direct and beneficial owner of more than 10% of the common stock of the Seiberling Rubber Co., has purchased 7,510 common shares. Direct holdings of common now amount to 53,800 and indirect holdings to 1,895. Direct holdings of 5% class A preferred stock has been reduced to 300 shares following sale of 100, and the direct holdings of 4½% preferred stock was eliminated through the sale of 50 shares.

Phelps Dodge Corp. has purchased 95,000 shares of common stock of the New Jersey Zinc Co. from the St. Joseph Lead Co. for an undisclosed purchase price. Phelps Dodge states that it bought the stock as "an investment." St. Joseph Lead, which had held 190,000 shares of New Jersey Zinc stock, will use the proceeds of the sale for expansion at its Pottstown, Penna., plant. The remaining 100,000 shares of New Jersey Zinc stock will be retained by St. Joseph Lead. As of September 30, 1955, there were 1,960,000 shares of New Jersey Zinc common stock outstanding.

American Viscose Corp.

For 1955: Net profit of $24,709,000 which is equal to $4.66 per share of common stock, compared with $10,487,000, or $1.85 per share of common stock, in 1954. Net sales of $259,000,000 in 1955 were $42,000,000 more than in the previous year.

Detroit Gasket & Mfg. Co.

For 1955: Net income of $2,062,940, which is equal to $2.65 a share, compared with $941,664, or $1.21 a share, in the preceding year. Net sales in 1955 amounted to $52,369,519, contrasted with $30,736,056 in 1954.

Thiokol Chemical Corp.

For 1955: Net income of $536,727, which is equal to $1.40 a share, compared with $270,776, or 77c a share, in the previous year. Net sales in 1955 amounted to $13,530,160, against $10,029,190 in 1954.

Cooper Tire & Rubber Co.

For 1955: Net income of $400,011, which is equal to $2.55 a common share, compared with $125,041, or 80c a share, in the preceding year.

Garlock Packing Co.

For 1955: Net income of $1,622,609, which is equal to $3.61 a common share, compared with $967,186, or $2.31 a share, in the preceding year.

Jenkins Bros.

For 1955: Net income of $1,320,386, is equal to $3.59 a share, against $777,991, or $6.10 a share, in the preceding year. The company report advises that net income for 1955 was reduced by $173,025 as the result of valuation of about 40% of December 31, 1955, inventories on the "Lifo" basis.

General Cable Corp.

For 1955: Net income of $6,547,558, compared with $5,219,933 in the previous year. Net sales in 1955 amounted to $129,367,506, up from $97,424,642 in 1954. The company's sales for defense needs last year were 55% lower than in 1954, representing only 5% of total sales in 1955.

U. S. Rubber Reclaiming Co.

For 1955: Net profit of $479,153, compared with a net loss of $167,842 in the previous year. The report states that the board of directors has appropriated from retained earnings $100,000 for anticipated expenses applicable to the consolidation of plant operations.

Raybestos-Manhattan, Inc.

For 1955: Net income of $3,738,496, which is equal to $5.95 per share of capital stock, compared with $2,798,094, or $4.45 per share of capital stock, in the previous year. Net sales in 1955 amounted to $82,905,705, against $66,769,939 in 1954.

American Enka Corp.

For 1955: Net profit of $7,070,902, which is equal to $5.22 per share of common stock, compared with $5,137,103, or $4.60 per share of common stock, in the preceding year. Net sales in 1955 totaled $71,251,062, against $59,692,723 in 1954.

Kerite Company

For 1955: Net income of $753,051, which is equal to $2.95 a share, compared with $452,679, or $1.77 a share, in the preceding year. Share earnings for 1954 have been adjusted to reflect a five-for-three stock split in October, 1955.

Brunswick-Balke-Collender Co.

For 1955: Net income of $1,371,771, which is equal to $2.52 a common share, compared with $692,230, or $1.21 a common share, in the preceding year. Net sales in 1955 amounted to $38,639,858, against $33,356,639 in 1954.

National Lead Co.

For 1955: Net income of $47,889,941, which is equal to $4.02 a common share, compared with $36,618,651, or $3.05 a share, in the preceding year. Net sales in 1955 amounted to $533,728,730, against $419,333,961 in 1954.

Flintkote Company

For 1955: Net income of $4,945,694, which is equal to $3.40 a common share, compared with $5,095,787, or $3.72 a share, in the preceding year. Net sales in 1955 totaled $100,995,922, against $94,804,706 in 1954.

Synthetic Latex Seminar

A technical seminar on synthetic latex polymers will be conducted for the Southern textile and paper industries on May 4 in Atlanta, Georgia. Sponsored by the Chemical Division of the Goodyear Tire & Rubber Co., the seminar will be held at the Georgia Institute of Technology in the auditorium of the Hightower Textile Building. Purpose of the Southern seminar is to present to interested members of industry a survey of today's latex polymers. Main topics to be covered include the development, production, evaluation, properties and uses of synthetic latices. Keynote speaker at the Atlanta meeting will be Herman R. Thies, general manager of the Goodyear Chemical Division. In opening the session, he will present a broad review showing the scope of this relatively new industry.

Dr. J. D. D'Ianni, assistant to the vice-president in charge of research and development at Goodyear, will speak concerning the "Theoretical Consideration of Polymerization and Latex Characteristics". Later in the program, he will discuss product development. A. E. Polson, manager of the Plastics Department of the Chemical Division, will describe "Sources of Materials for Latex Manufacture". He also will open the afternoon session with a slide presentation showing production of synthetic latex. Two papers will be delivered by Willard C. Smith, Latex and Adhesives Section head for the Chemical Materials Development Department. "Properties of Latex Systems and Evaluation Procedures" and "The Influence of Latex Variance on Important Performance Characteristics" are the two topics being reviewed by Mr. Smith. Earl W. Scott, sales service representative for the Chemical Division's Coatings Department, will present "A Survey of Latex Applications and Potentials" in the various coating fields.

The seminar will be concluded by Mr. Thies. His summation will outline the significance of the points presented during the program. Following the seminar, guests will be invited to inspect an exhibit prepared by the Goodyear Chemical Division. The display will illustrate a variety of interesting applications for latex in the textile, paper, paint and other coatings fields. A similar seminar was conducted last October for the Northwest paper industry in Camas, Wash. More than one hundred representatives of the paper, lumber, textile and paint industries attended the session.

To Construct Latex Installation

Rubber Corp. of America, Hicksville, N. Y., has entered into an agreement with the Georgia Ports Authority calling for the construction of a bulk storage installation for natural rubber latex at the Port of Savannah, Ga. The installation will be ready to receive shipments of natural rubber latex directly from the Far East some time during the month of June, 1956. These new facilities will enable the Rubber Corp. of America to give speedier and more efficient service to latex consumers in the Southeastern states and will result in considerable freight savings to them, the company states.

Colombian Plant in Operation

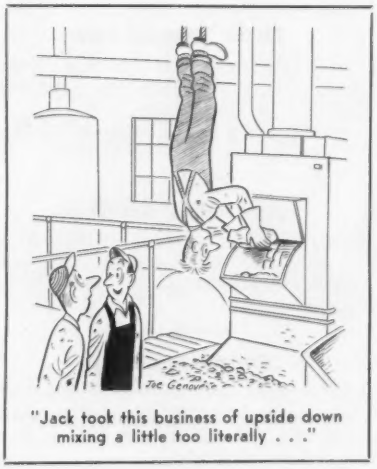
Tires are now rolling off the production line in a new factory in Colombia, South America, following recent dedication and open house ceremonies at the plant in Bogota. A new South American company — Productos De Caucho Villegas, S.A. — was formed in 1954 by the Seiberling Rubber Co. of Akron, Ohio and a group of Colombian businessmen. Construction of the new plant was begun late in 1954. Another rubber firm, Almacen Villegas was incorporated into the new company. Almacen Villegas was Colombia's largest rubber flooring manufacturer, and a leading producer of footwear, tread rubber and other rubber products. Initial capacity of the new plant will be about 75,000 truck and passenger tires annually, plus inner tubes, truck tire flaps and tread rubber stock. This is Seiberling's first full-scale overseas manufacturing operation. The factory was designed and engineered by Seiberling, which also supervised its construction, furnished machinery and molds and is training Colombian personnel for key positions in the company.

To Close Wilkes-Barre Plant

Okonite Co., Passaic, N. J., plans to close its Wilkes-Barre, Penna. plant within a year and move the plant's operations to its recently purchased plant at New Brunswick, N. J. Okonite recently purchased the 160-acre former Studebaker-Packard plant for $4,205,000 from Volkswagen of America, Inc. In a letter to Okonite's employees, R. Stuart Keefer, president, also said the facilities at the firm's Passaic plant, as well as at Wilkes-Barre "are inadequate from a standpoint both of efficient operation and our potential growth". Plans are to transfer some of the Passaic plant's operations this summer, Mr. Keefer said.

Harris Products Changes Name

Harris Products Co., 6545 Carnegie Avenue, Cleveland 3, Ohio, has announced a change in company name to Clevite Harris Products, Inc. The change has been made to identify the company more closely with the Clevite Corp., of which Clevite Harris Products is a subsidiary.



"Jack took this business of upside down mixing a little too literally . . ."

Proposes Technology Course

The Buffalo Rubber Group reports that for some time it has been felt that the Buffalo Metropolitan Area has been lacking in facilities for presenting to interested persons some of the basic practical aspects of rubber technology. To meet this need it has been proposed that the Buffalo Rubber Group take an active part in presenting, in conjunction with the University of Buffalo, a primary course in Rubber Technology. This would take the form of a 16 week lecture course to be held at the University of Buffalo and would be open to all who are concerned with the various phases of rubber handling, compounding, and processing. This would include salesmen, purchasing agents, production supervisors, scheduling, compounders, students, and others interested in broadening their knowledge of the rubber industry.

A nominal fee would have to be charged somewhere in the neighborhood of $30 to $40, the exact amount dependent upon the University's charge for space and facilities. Most probably University credit could be arranged for those who so desire and can meet certain requirements. The present plan is to determine the amount of interest shown by members of the Buffalo Rubber Group towards such a course and then approach the University of Buffalo if the response is favorable.

Gallagher Joins Georgia Marble

Georgia Marble Co., Tate, Ga., has announced the appointment of Dr. Milton Gallagher as director of research and development for the Calcium Products Division. Dr. Gallagher was formerly connected with the Industrial Research Institute of the University of Chattanooga, where he was working on projects for the Atomic Energy Commission, the General Electric Co., and the Redstone Arsenal. Dr. Gallagher received his Ph. D. in physical chemistry from the University of Illinois. He has also been associated with Owens-Corning Corp., and the Tennessee Eastman Corp.

Mueller Plans Trip Abroad

Dr. Hans J. Mueller, consulting chemist and engineer of 451 Deming Place, Chicago 14, Ill., is leaving for Europe on June 8 for an extensive tour of the continent. Dr. Mueller is also a professor of chemistry at the University of Illinois, and has been active in the rubber field for 27 years. Companies and individuals interested in European business or manufacturing methods are invited to contact Dr. Mueller at the University of Illinois, Navy Pier, Chicago, Ill.

Hirtle Joins Indoil Chemical

Russell C. Hirtle has joined the sales staff of the Indoil Chemical Co., Chicago, Ill. He will headquarter in Boston, Mass., and will represent the company in the New England area. Mr. Hirtle was previously associated with Armour & Co. in Chicago and in New England.

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West Coast News

The March 6th meeting of the Los Angeles Rubber Group held at the Hotel Statler in Los Angeles, Calif., was addressed by Philip C. Servais, manager of the Silastic Section of the Dow Corning Corp., Midland, Mich. Mr. Servais addressed the group on "The Compounding and Properties of Silicone Rubber".

In his talk, Mr. Servais noted that silicone rubber polymers and compounded stocks are available to the rubber compounder and fabricator. Modifications of the polymers and the compounding make possible stocks suitable for knife and solution coating, molding, extruding, calendering and sponging. Other variations produce rubbers with flexibility at temperatures as low as —180°F., hot oil resistance, low shrinkage, low compression set and enhanced heat stability.

Polymers, fillers, additives and vulcanizing agents must be carefully selected to develop optimum properties. Care must also be used to insure silicone rubber stocks with suitable handling properties. Organic ingredients must be excluded since the vulcanization of silicone polymer is accomplished with organic peroxides, Mr. Servais stated.

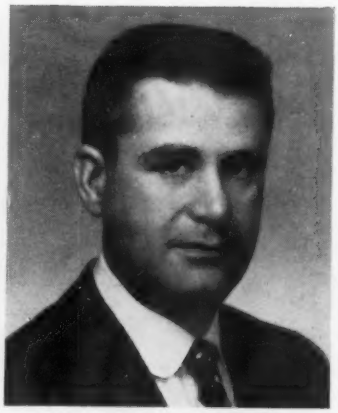
Compounding and processing are quite dependent on the proposed use of the silicone rubber. Oven cure can be modified to enhance certain properties that are important to the end user, he concluded.

The non-technical portion of the meeting was addressed by John F. Malone, special agent for the Federal Bureau of Investigation in charge of the Los Angeles office. Mr. Malone gave an interesting and entertaining talk on "Functions of the FBI".

Atlas Electric Devices Co., Chicago, Ill., has announced the appointment of two new West Coast representatives who will handle both sales and service of Atlas "Fade - Ometers", "Weather - Ometers", "Launder-Ometers" and related equipment. John K. Bice Co., Los Angeles 13, will represent Atlas in Southern California. Mr. Bice has supplied basic raw materials and machinery to the paint, plastic, rubber and other industries in that area for a number of years.

In Northern California, Atlas will be represented by Pacific Coast Chemicals Co., Berkeley 10. Harold M. Brez and Arthur E. Wolff, partners in the Pacific Coast Chemicals Co., are men of experience in industries where Atlas Fade-Ometers, Weather-Ometers and Launder-Ometers are essential for the accelerated testing of their products. Most of the raw products and machinery handled by both companies are supplied to organizations producing products that require predetermined reaction to weathering, fading and laundering. Atlas Ometers thus constitute a well integrated addition to the products already handled by them.

Carl Eugene Huxley has been named technical sales representative for the West Coast area by the Butyl Division of Enjay Co., Inc. Enjay said the West Coast office of its Butyl Division will be located at 3325 Wilshire Boulevard in Los Angeles. Opening of a West Coast office represents a further step in the expansion of its Butyl rubber business, the company indicated. Mr. Huxley has been associated with the rubber industry in the area for thirteen years. For the last three years he has been chief chemist of the Pacific Moulded Products Co., and for ten years prior to that he was chief chemical engineer for the Western Insulated Wire Co.



Carl E. Huxley

Paisley Products, Inc., New York, N. Y., has announced the acquisition of Woerz Paste and Gum Co. of Los Angeles, Calif. The firm will be operated as a Paisley Division, and plans are being made for expansion of sales, warehousing, and manufacturing facilities. Ralph C. Woerz, former owner-manager, will continue as general manager of the Los Angeles Division. He will direct and expand its sales staff in the Southern California area to bring improved distribution of the combined Woerz-Paisley line of industrial adhesives and resins to the West Coast area. In addition, the Los Angeles plant will provide warehousing and technical sales servicing of the product line of the parent company, Morningstar, Nicol, Inc., of New York City, who are importers and processors of arrowroot, tapioca flour, potato starches, dextrines, natural water soluble gums, emulsifiers and stabilizers.

Harwick Standard Chemical Co. of Calif., 1248 Wholesale St., Los Angeles, has been named California distributor for three silicone mold release materials made by the Silicone Products Department of the General Electric Co. Harwick will be distributor for "SM-55", "SM-61", and "SF-96" (300), used in rubber and plastic molding and finishing operations. D. C. Maddy, vice-president, is in charge of distribution of these products. General Electric's silicones are manufactured at the Waterford, N. Y. plant of G-E's Silicone Products Department.

Stillman Rubber Co., Culver City, Calif., has broken ground on an 8,000 square foot, two-story office utilities and warehouse building adjacent to the company's main plant at 5811 Marilyn Ave., Culver City. Completion of the concrete block building is scheduled by June 1. With divisions in California and Cleveland, Ohio, Stillman produces a wide range of custom molded parts, silicone and synthetic rubber O-rings, and hydraulic packings to government and commercial specifications.

Appointment of Warren DeBus as assistant manager of the Pacific Coast Sales Division of the Firestone Tire & Rubber Co. has been announced by C. M. Barnes, division manager. In his new position, Mr. DeBus will have charge of retail store operations in nine western states. He was formerly district manager in Seattle.

Philip K. Coe, former Goodyear executive in Los Angeles, was recently awarded a 40-year service pin by the company. He is now manager of the firm's manufacturers sales office in Detroit and assistant to the vice-president in charge of manufacturers sales.

The February meeting of the Northern California Chapter of the Society of the Plastics Industry combined chapter business with a showing of a movie on silicone rubber. The movie, produced by the Dow Corning Corp., Midland, Mich., was introduced by Robert Stewart, Dow Corning's Northern California representative. The new officers elected by the chapter for 1956 are: *President*, John L. Morrill (Hexcel Products); *Vice-President*, John Moore (Owens-Corning Fiberglas); *Secretary*, Julius Palen (Remler), and *Treasurer*, Frederic M. Rea (Western Plastics).

Stoner Rubber Co. has announced plans for a 12,000 square foot expansion of their plant at Anaheim, Calif.

Avery Adhesive Label Co. has been issued a permit for an $180,000 addition to its plant at Monrovia, Calif. The new addition will contain 19,200 square feet of floor space and will house office, laboratory and warehouse.

Park Manufacturing Co. has broken ground at their new plant site located in Compton, Calif.

Franklin C. Wolfe Co. has completed their new plant in Culver City, Calif., and are scheduled to move into the new, 60,000 square foot building in April. New equipment includes a 60-inch mill, two 30-inch mills, a tuber and new laboratory equipment.

Jack Kyger has been promoted from supervisor to foreman of the Los Angeles warehouse of the Goodyear Tire & Rubber Co. He succeeds John H. Barrowcliff.

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Canadian News

Canadians are being asked not to look for any early change in automobile tire prices as a result of the 37% drop in crude rubber prices over the last two months. Tire makers in Canada usually accept, for a time, any benefits from lower rubber costs. This helps balance out the adverse cost trend when rubber prices go the other way, they claim. In addition, the hike in labor costs growing out of current wage negotiations is going to cancel out a good part of the saving from lower rubber prices.

Tire makers are looking for another excellent year with production at least as good as last year when total output of 7,379,000 tire units represented an all-time peak and a 20% boost from the previous year.

In the first two months of 1956, production was up 15-20% but sales lagged about as much as that from the same period last year. Tire makers in Canada appear unperturbed over the lower sales trend. They claim the General Motors shut-down through most of this period accounted for almost all of the reduction in sales to new equipment manufacturers. They are looking to a sizable spurt in both replacement and new equipment sales over the next couple of months.

A feature of the tire business this year has been the spurt in demand for truck tires. Reflecting sharply higher truck sales and production in first two months of the year, sales of truck tires have doubled over the same period last year. Tire officials are looking for a continuation of this trend throughout the rest of the year.

Although Canada's Crown-owned synthetic rubber producer—Polymer Corp.—has been expanding output steadily, it has been unable to meet mounting demands of the domestic market—particularly tire makers—and at the same time maintain established export business. As a result, domestic tire makers have been importing increasing quantities of synthetic rubber from U. S. producers. In the 11-month period ended Nov. 30, 1955, imports amounting to $4,602,955 represented a tripling in volume over the same period of the previous year.

Rubber footwear manufacturers in Canada say imports will take 71% of Canadian sales this year if the present rising trend of imports continues. Manufacturers fear for the future of the $25,000,000 industry, which pays $15,000,000 a year in wages. The newly formed Canadian Rubber Footwear Information Office, of which most Canadian manufacturers are members, says rubber footwear imports in the first 10 months of 1955 took 54% of the present market.

This group says Hong Kong manufacturers, who have pushed exports to Canada, have offered to supply complete lines to the existing Canadian firms. Japan and Brazil have made similar offers. The Canadian manufacturers claim they can't meet prices on imports from such sources because of a big difference in wage rates. The gradual acceleration of imports has reduced the number of employees in the Canadian rubber footwear industry from 7,300 in 1949 to 4,500 at present, the group says.

Imperial Paper and Color Corp., Glens Falls, N. Y., has announced its plans to manufacture a line of chemical pigment colors in Canada. A subsidiary Canadian corporation is being formed and a plant has been purchased in St. Johns, Quebec. Plans are being made to manufacture many of the same basic pigments that Imperial Paper is now making in its Glens Falls plant. The colors now being made in Glens Falls are currently being sold in Canada through Imperial's subsidiary, Glens Falls Color Export Corp., a western hemisphere sales organization.

Production will be started as soon as the special equipment necessary for the manufacture of modern colors can be installed in the St. Johns buildings. It is expected that ultimately the Canadian corporation will take over most of the sales now handled by the Glens Falls Color Export Corp. However, any colors which may not be made in Canada will still be available through the export subsidiary.

Chemists and chemical engineers from all Canada have indicated that they intend to take part in the 39th Annual Conference and Exhibition of The Chemical Institute of Canada to be held in Montreal, May 28-30, 1956. While discussing the value of this annual event, not only to technical men but to industries and Canada at large, T. H. C. Raikes, chairman of the Conference, suggested that the growth of the Canadian chemical industry into a billion dollar a year business can be attributed in no small way to the exchange of information at these Annual Conferences. "So many new developments, methods, products, and machines appear each year, that few in the chemical field can keep abreast of everything, but a meeting such as this does provide an opportunity for all to obtain a quick review of general trends, as well as the latest information in their own specialties." The Conference and Exhibition will be held at the Sheraton-Mount Royal Hotel, with some lectures at McGill and the University of Montreal.

Sales to customers in 1955 amounted to $65,461,000, it was announced in the annual report of DuPont of Canada Securities, Ltd., released recently. The increase of 18% over the previous year was attributed to improved business conditions in Canada combined with foreign demand for certain products manufactured by its wholly-owned operating subsidiary, DuPont Company of Canada, Ltd.

Net income at $6,369,000, equivalent to 86 cents a common share, was 51% higher than in 1954 when earnings were adversely affected by costs necessarily incurred during the initial operating period of the Maitland, Ont., nylon intermediates plant. Dividends on the common stock declared in 1955 totaled 50 cents a share, the same rate as in 1954 and the preceding four years.

Canadian Industries Ltd., has announced that a safety record of almost 10 years without a lost-time accident has been achieved by the central research laboratory at McMasterville. For this achievement, the laboratory has won the highest award under the company's no-accident record plan—the C-I-L prize—for the third successive time. The record represents 3,607 accident free days or 1,637,900 accident free manhours. The last injury at this location occurred in April, 1946. The laboratory staff, consisting chiefly of chemists and chemical engineers, will be presented with individual awards at a later date.

The 1955 annual report of the Polymer Corp., Ltd., released on March 22, records a year of achievement in sales and production. Polymer earned a net income of $7,500,000 after provision of $4,900,000 for depreciation and $6,600,000 for income tax. Sales reached a new record high of $61,500,000 increasing 15.7% from those of 1954. A large increase in production was a major contributing factor, reaching a level of 231,000,000 pounds, highest in the company's history. Dividends during the year totalled $5,000,000. Thus, dividend payments amounted to $2.50 per share from net earnings of $3.77 per share.

Expenditures for new plant and equipment totalled $4,900,000 in 1955, primarily to increase capacity of operating units, particularly in the ethylene recovery unit and the copolymer plant. A new rubber warehouse and merchanical shops were completed and additional latex blend tanks as well as underground storage wells were added.

President J. D. Barrington predicts a continuing strong demand for "Polysar" rubbers, so that the outlook for this Canadian company is considered to be excellent. Increasing world demand for chemical rubbers will undoubtedly affect expansion plans for the Polymer Corp.

Construction of a plant to make "Orlon" acrylic staple fiber, one of the newest man-made fibers, will begin immediately at Maitland, Ont., between Brockville and Prescott, DuPont Co. of Canada Ltd., has announced. The new plant, which will cost more than $8,000,000, will have a capacity sufficient to meet all foreseeable Canadian requirements and will be erected adjacent to the company's nylon intermediates plant which went into operation late in 1953. It will initially employ about 200 people. The plant is expected to be in operation by the middle of 1957.

A newly-revised 4-page booklet has just been issued by Acheson Colloids Co., Port Huron, Mich., listing 42 colloidal and semi-colloidal dispersions, including operational and mold release lubricants for the rubber, plastics and other industries.

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Nothing whitens and brightens rubber and plastic goods better than titanium dioxide pigments. And TITANOX white pigments are the No. 1 choice in titanium dioxide. Titanium Pigment Corporation (subsidiary of National Lead Company), 111 Broadway, New York 6, N. Y.; Atlanta 5; Boston 6; Chicago 3; Cleveland 15; Houston 2; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 14, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

3848-A

Obituaries

Robert S. Pearce

Robert S. Pearce, superintendent of the Reclaim and Preparatory Division at the Gadsden, Ala., plant of the Goodyear Tire & Rubber Co., died on March 2 in City Hospital, Akron, Ohio. He was 51 years old. Mr. Pearce had been in ill health and on leave of absence from the company since November, 1955. A native of British Columbia, Mr. Pearce attended high school in Akron and the University of Akron. He joined Goodyear in 1928, working in the Crude Rubber Department. Later that year he was assigned to the squadron and subsequently to the Production Control Department. Between 1928 and 1936 he alternated between the stockroom, production control and the squadron. Following a period of special training in 1936, he was assigned to supervisory work. In 1937, Mr. Pearce transferred to Goodyear's plant in Jackson, Mich., where he rose to the post of foreman of the Banbury Division. During the war, he transferred to Gadsden as a department foreman. He was named assistant division superintendent in 1946 and was named superintendent in charge of tubes, reclaim, soles and heels in 1947. He served as superintendent of the Reclaim and Preparatory Division since 1949.

Alfred A. Halden

Alfred A. Halden, executive vice-president and a director of National Starch Products, Inc., New York, N. Y., died on March 19 at his home in Scarsdale, N. Y. He was 61 years old. Mr. Halden was graduated from Columbia University in 1915, and two years later from the Columbia School of Engineering. He served with the Chemical Warfare Service in World War I and joined the staff of National Starch Products in 1919. Mr. Halden became manager of the company's plant in Plainfield, N. J., and after taking charge of production there, was elected a director in 1932. He became secretary of the company in 1938 and vice-president in charge of manufacturing in 1942. Mr. Halden was a director of the Adhesives Association of America and the American Chemical Society. He is survived by his wife and daughter.

Carl R. Hallock

Carl R. Hallock, secretary of the Worthington Ball Co., Elyria, Ohio, since 1927, died at his some in Elyria on February 13 after a lingering illness. He was 72 years old. Born in Kent, Ohio, on January 14, 1884, Mr. Hallock was associated with the old Columbia Steel Co. for twenty years. Later, he joined Worthington Ball. He had lived in Elyria for forty-two years. Mr. Hallock was graduated from Kent High School and attended college in Cleveland. He was active in Masonic affairs. Services were held on February 16 in Elyria with interment in Brookdale Cemetery. He is survived by his wife.

C. Leslie Brittain

C. Leslie "Les" Brittain, vice-president of Gutta Percha & Rubber, Ltd., Toronto, Ont., Canada, died suddenly on March 3 at his home in Toronto. He was 54 years old. Mr. Brittain was graduated from the University of Toronto in 1924 with a degree in mechanical engineering, and joined Gutta Percha that same year as assistant chief chemist. In 1936, he was appointed superintendent of the Mechanical Factory Development Department. In 1946, Mr. Brittain was named superintendent of methods engineering and in 1950 was named factory manager. On September 1, 1955, Mr. Brittain was appointed vice-president in charge of development and control, the post he held at the time of his death. During World War II, Mr. Brittain served as chairman of the Rubber Technical Committee. This was the committee set up by the Rubber Controller to deal with the technical problems of the Industrial Products Division of the rubber industry. Mr. Brittain is survived by his wife, a daughter and a son. Another son passed away some years ago.

Joseph D. Sharkey

Joseph D. Sharkey, manufacturers' sales manager of the Firestone Tire & Rubber Co., died on February 26 at General Hospital, Akron, Ohio, after a short illness. He was 51 years old. Mr. Sharkey joined the Firestone organization in 1930 as a sales representative. In 1932, he was named truck tire representative in Kansas City. A year later, Mr. Sharkey was named assistant district manager in Kansas City and in 1934 became district manager in Omaha. From 1938 to 1945, Mr. Sharkey served as district manager in Chicago. From 1945 to 1949, he was manager of the midwest sales division. His next post took him to New York, where he was sales manager of the eastern division from 1949 to 1953. Since 1953, Mr. Sharkey had been back in Akron as manufacturers' sales manager. He leaves his wife and two sons, one of whom is also employed by Firestone.

Charles W. Simpson

Charles W. Simpson, who had been associated with three different rubber companies during his career in the rubber industry, died on February 27 in Lyndhurst, a suburb of Cleveland, Ohio. He was 79 years old. Mr. Simpson retired in 1951 after having served as district sales manager in New York City for the Seiberling Latex Products Co. since 1928. From 1920 to 1928, Mr. Simpson served as a sales representative for the Faultless Rubber Co. of Ashland, Ohio. Prior to that, he was associated with the B. F. Goodrich Co. Mr. Simpson is survived by his wife and daughter.

Paul J. Kolachov

Dr. Paul J. Kolachov, noted biochemist who was associated in early developmental work on kok-saghyz as a substitute for Hevea rubber, died in Bogota, Colombia, on February 29. At the time of his death, Dr. Kolachov was associated with Armour & Co., Chicago, Ill. A native of Russia, Dr. Kolachov held engineering degrees from two Czechoslovakian institutes. In the 1930's, he came to the United States and accepted a post as professor of zoology at Columbia University. Later, he joined Seagram & Sons Co. and conducted research on the production of alcohol from sweet potatoes. Early in World War II, Dr. Kolachov proposed the cultivation of kok-saghyz as a source of rubber. He stated that he had learned of the plant's use from confidential sources in the Soviet Union. In 1944, he was elected president of the Kentucky Academy of Science, and in 1950 he served as the U. S. representative at the Fifth International Congress for Microbiology in Rio de Janeiro. In 1951, Dr. Kolachov left Seagram to open an office in Chicago as an industrial consultant. Subsequently, he joined Armour. He had been in South America since last April. Dr. Kolachov is survived by his wife and son.

Thomas E. Boyle

Thomas E. Boyle, manager of international and technical services for the International B. F. Goodrich Co., Akron, Ohio, died on March 20 in Akron City Hospital. He was 52 years old. Mr. Boyle had been associated with the Goodrich organization for 30 years and was first employed in the company's chemical laboratory in Akron following his graduation from the University of Arkansas. He later served in the tire technical department, in tire production and the company's training program. In 1948, he went to New Zealand to manage a new tire manufacturing plant for Reid New Zealand Rubber Mills, a Goodrich associate company. He returned to Akron in 1955 and assumed his last assignment in December of that year. Mr. Boyle leaves his wife and son.

Henry V. Powers

Henry V. Powers, technical sales representative for the C. P. Hall Co., Akron, Ohio, for the past six years, died on December 20, 1955. Mr. Powers joined the sales staff of the C. P. Hall Co. in 1950. He had previously been associated with the J. J. White Co. of Cleveland, Ohio. Prior to that association, Mr. Powers had spent thirty years with the Goodyear Tire & Rubber Co., starting his employment there in 1916.

A quality tag program to aid buyers of polyethylene pipe is being inaugurated by Bakelite. The program's purpose is to offer the buyer a simple, practical means of selecting pipe made from material designed specifically for use in flexible pipe.

An index to Volume 78 of RUBBER AGE will be found on Pages 183 to 186 of this issue.

Anaconda specifies Enjay Butyl rubber

TO DEFY OZONE IN HIGH-VOLTAGE CABLES...

for more current per circuit... more power per dollar

Anaconda specifies Enjay Butyl insulation for high-voltage cables because this rubber has incredible resistance to ozone. Surpassing the industry's standard three-hour specification test, Enjay Butyl insulation used by Anaconda showed *no injury after 72 hours* of ozone concentration tests—24 times longer than specification requirements. Other rubbers would deteriorate and crack in a fraction of this time.

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Perhaps *your* product, too, can be improved with versatile Enjay Butyl. It comes in non-staining grades for white and light-colored parts, offers excellent electrical properties, low price and *immediate availability*. For full information, contact the Enjay Company. Complete laboratory facilities and technical assistance are at your service.

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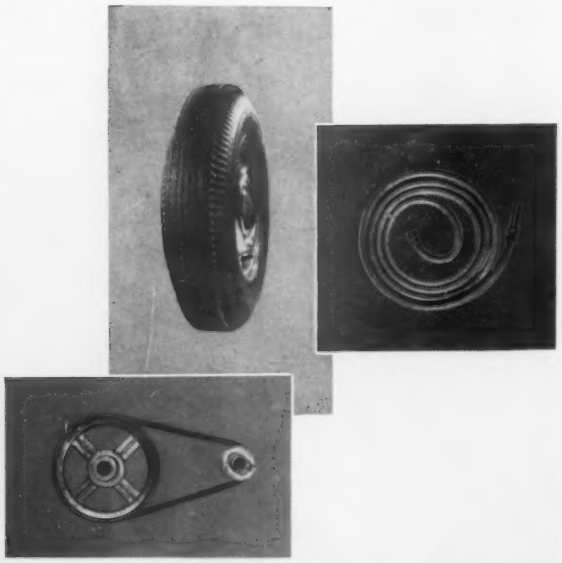

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■ SYNVAR can solve many of those adhesion problems constantly arising in the manufacture of rubber-fabric products. Take latex dip solutions, for example. Straight resorcinol-formaldehyde (R-F) solutions, added to the dip to improve adhesion, are usable for only 24 hours. Short life of such bonding agents results in a waste of money and time. Synvar bonding resins give latex solutions longer working life; eliminate gelling of dips.

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■ SYNVAREN 631 and SYNVARITE BRLD, the phenol-formaldehyde bonding resins for latex dips, have excellent stability. These resins give somewhat lower specific adhesion than SYNVAREN PLS-R, and are considerably lower in cost. Either resin can be used alone or in combination with SYNVAREN PLS-R to obtain balanced physical properties.

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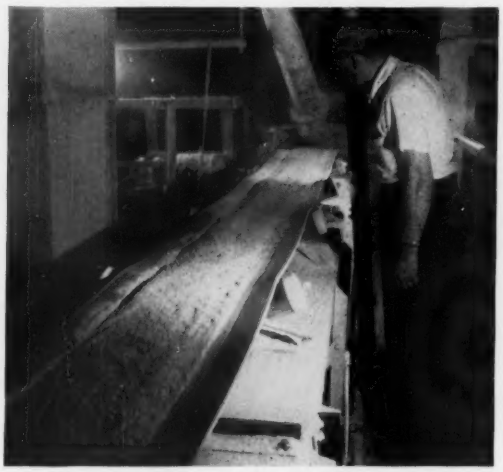
New Goods

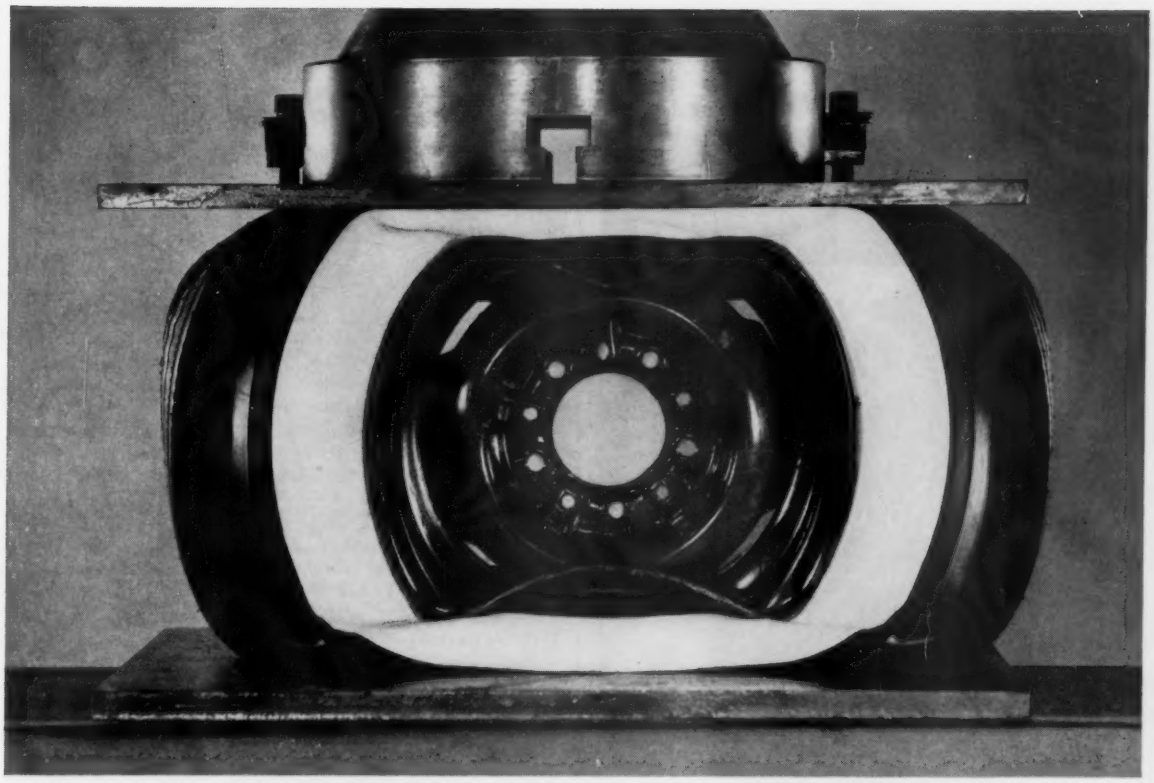
Solarflex Hot Material Belt

A new kind of rubber conveyor belt that is said to outlast conventional "hot material" belts by as much as three-to-one, has been announced by the B. F. Goodrich Co. Industrial Products Division, Akron, Ohio. The new line of hot material belts, known as "Solarflex", is made with a special synthetic rubber notable for its resistance to the effects of heat. Field tests indicate that the rubber remains pliable and elastic even when exposed for long periods to the baking action of hot materials at temperatures up to 350°F. Conventional hot material belts soon harden and crack under such heat conditions, the company states. The new Solarflex construction permits more efficient service from mechanical belt splices. Fasteners of this type fail by tearing out as the belt carcass hardens and cracks under the effects of heat. Both rubber and belt carcass in Solarflex construction retain their flexibility, it is said. The new belt is available in a choice of fabric reinforcement which includes glass fabric, rayon-nylon, rayon, cotton-nylon and cotton.



Goodyear Furnace Door Hose

A greatly improved open-hearth furnace door hose for steel mills has been developed by the Goodyear Tire & Rubber Co., Akron, Ohio. All materials for the new hose were selected to resist natural hazards encountered in open-hearth steel making. The hose consists of a tube made with a special rubber compound to handle hot water and steam, which is reinforced with steel wire braid and insulated with asbestos to resist searing heat. The outside of the hose is covered with an open braid of stainless steel wire that will not rust. The steel mesh cover protects the asbestos insulator, increases the flexibility of the hose and minimizes build up of molten spatter. Manufactured with inside diameter sizes of one-inch, one and a quarter inches and one and a half inches, the hose will be furnished in 45 to 50 foot lengths or specified lengths on special order.



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User after user will tell you that Sun's Circosol-2XH is *the* elasticator for oil extended polymers.

Tires made with Circosol-2XH have much greater resistance to wear; maintain higher resiliency and give increased mileage. Circosol-2XH even helps tires go through hard driving on hot summer roads without damaging build-up from heat!

Circosol-2XH is ideal for carcasses of white sidewalls. It will not migrate or stain.

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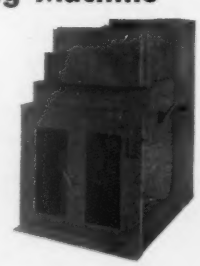
Here at last is the answer to your problems of dicing rubber or vinyl sheet stock. Produces perfect cubes ranging in size from ⅛ to ½" by merely changing knives.

Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

Input speeds range from 10 to 125 feet per min. depending on material and size of cube desired.

The CUMBERLAND Rotary Chopping and Dicing Machine



As a chopper, **this machine efficiently cuts rubber and vinyl slabs into small pieces. Two sizes available to handle stock widths up to 14 or 24 inches.**

As a dicer **in modified form, handles principally vinyl sheet stock. A less expensive machine though less universal than the "Stair-Step" Dicer shown above.**

For Granulating Plastic . . .
Investigate Cumberland's complete line of granulating machines. Request Bulletin 260.

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Builders of Better Machines for the Rubber and Plastics Industry

No-Skive Hoze-lok Line

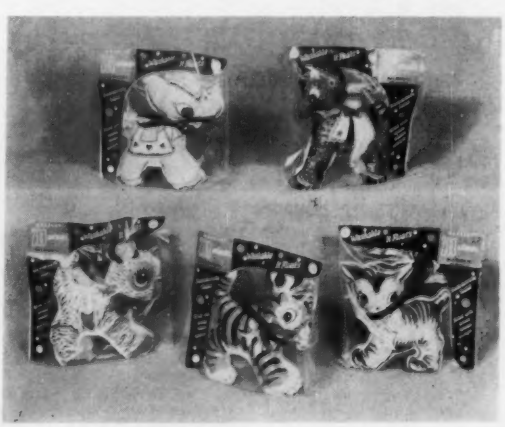
To meet the long demand for easier make-up of hydraulic hose assemblies incorporating rubber-covered wire braid hose, the Tube and Hose Fitting Division of the Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio, has developed a "no-skive" type of re-usable fitting. The new fitting consists of socket and nipple. It does not require the hose cover to be stripped off. Make-up is accomplished in two simple steps: (1) The hose is rotated into the socket counterclockwise, and (2) the nipple is screwed clockwise into the hose and socket. The lead thread of the socket, acting like the colter wheel on a plow, cuts through the rubber cover of the hose permitting the following threads to contact the wire braid. This engagement forms a tenacious grip that holds beyond hose-bursting pressures as well as under severe vibration conditions.

The new "No-Skive Hoze-lok" line offers four different connecting ends: (1) Tapered male pipe thread; (2) New straight thread with O-ring sealing; (3) J.I.C. standard Triple-lok 37° flare nose for tube connection, and (4) Swivel nut for connection with any type Triple-lok adapter. The fittings are precision machined from high tensile strength steel barstock. First sizes available are for hose of ¼, ⅜, and ½-inch inside diameter.

The hose being offered has a tough outer cover which is resistant to oil, weather and abrasion. Proper braiding of the steel wire retains good flexibility while providing necessary strength. One wire-braid hose is offered for medium pressure use and two-wire for high pressure. The seamless inner rubber tube is suitable for service with hydraulic fluids, hot oil, grease, lubricants, crude and fuel oils, gasoline, liquified petroleum gas, air, and water.

Mousley Zoo Animals

The Toy Division of George E. Mousley, Inc., 200 Fifth Avenue, New York 10, N. Y., is now marketing a new line of "Zoo Animals", cuddly, washable toys that float. Made of "Ultron" vinyl film, the toys are



stuffed with a sponge rubber mixture and electronically bell fastened at the neck. Each toy is realistically colored sealed. Each animal has a gay little ribbon and jingle and packaged in a polyethylene bag. Now available are a leopard, elephant, horse, tiger, and kitten.

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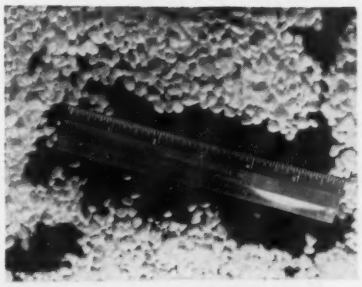

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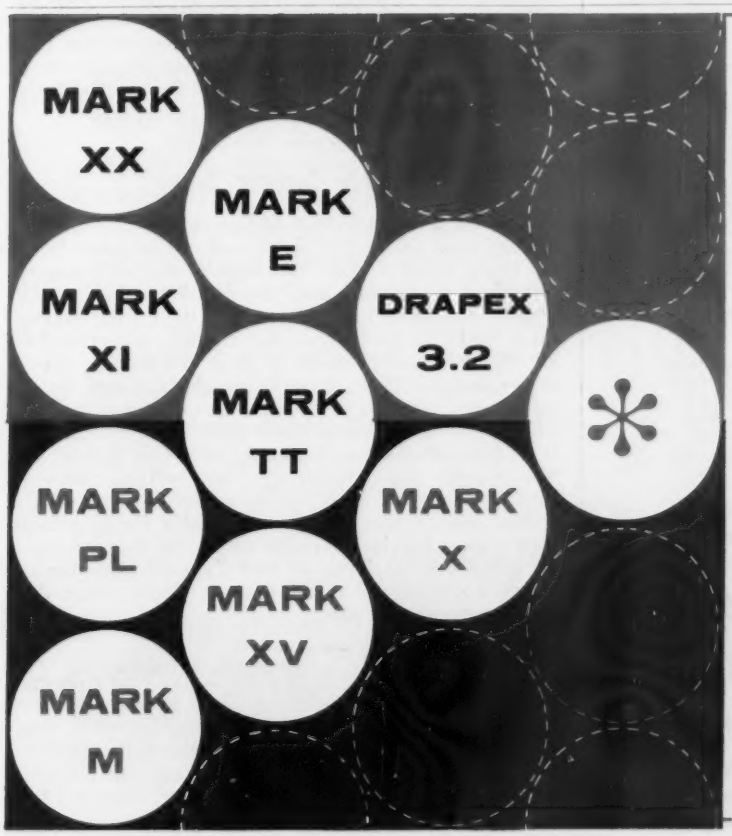

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New Automobile Floor Mat

Improved strength and durability are said to have been built into the new, snug-fitting automobile floor mats made by Better Monkey Grip Co. of Dallas, Texas. The better physical properties of the mats are attributed to the use of "Pliolite S-6B," a rubber reinforcing resin produced by the Chemical Division of the Goodyear

Tire and Rubber Co. Use of Pliolite S-6B, a copolymer of high styrene content, provides the mats with stain-proof qualities and resistance to oils and greases. It also protects them against the abrasive action of soot and grime. Featuring a simulated leather-like feel and appearance, these rubber floor mats complement the fashionable interiors of today's automobiles. They are available with non-skid surfaces in either horizontal or diamond shaped wedge patterns.

Republic Conveyor Belting

A new type of conveyor belting with a load-carrying carcass made of plies of frictioned cotton-nylon fabric, the fabric being woven from high tension cotton warps and nylon fillers, has been developed by the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, Ohio. It is designed for use where regular belting of the required number of plies and weight of duck is too heavy, where greater troughing would be advantageous when an installation does not have sufficient take-up room, or where small pulleys are encountered. It will trough and train better, has 25% lighter carcass weight, has less stretch, and will operate over smaller pulleys at higher speeds. While belts of this general construction have been available for long flight, high tension service, Republic offers the above features in their Type 30, Type 50 and Type 70 belts for use where 32 ounce, 42 ounce and 48 ounce cotton duck would normally be used.

Martin Rubber Co., Long Branch, N. J., is now marketing a streamlined and modernized version of one of its earlier staples, the "Martin Exerciser and Body Builder". Molded in deep amber rubber, the exerciser is individually boxed in a 3-color package that illustrates how the unit is used to develop the arm, chest and back muscles.

POLYSAR can help to solve your rubber problems.

Why?

Because Polysar's quality, uniformity and customer service plus the wide variety of Polysar types enable you to select the best rubber for the job.

Polysar is available in the following types:

- General Purpose
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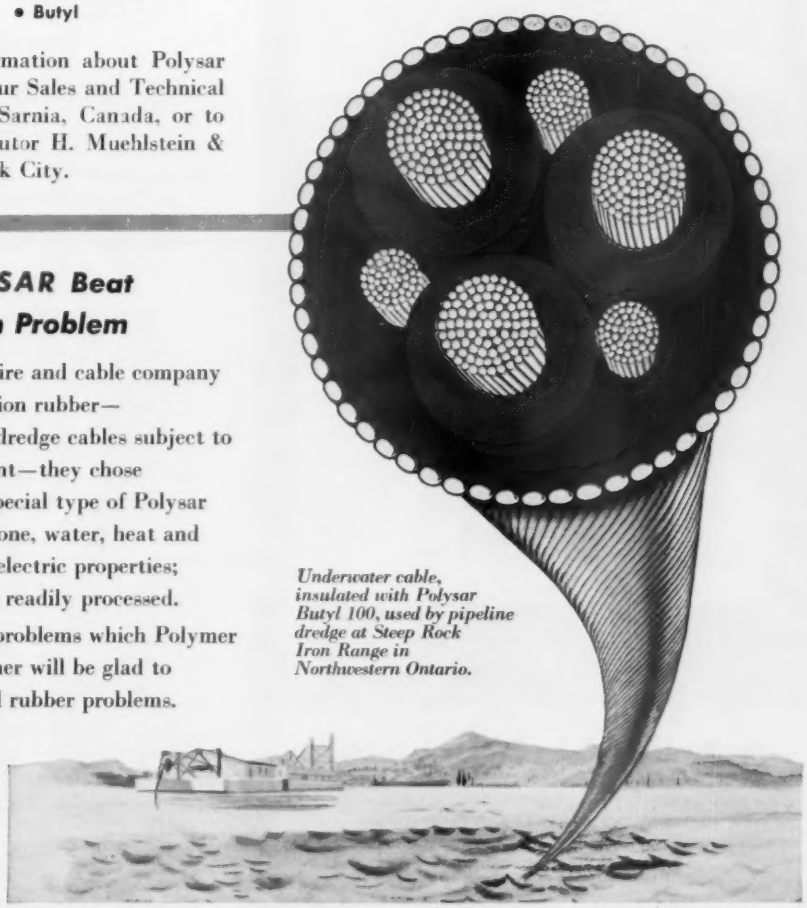
- Oil-resistant
- Butyl

For detailed information about Polysar rubbers write to our Sales and Technical Service Division, Sarnia, Canada, or to our U.S.A. distributor H. Muehlstein & Co. Inc., New York City.

Here's How POLYSAR Beat a Critical Insulation Problem

When a large Canadian wire and cable company was looking for an insulation rubber—to be used in underwater dredge cables subject to extremely rugged treatment—they chose Polysar Butyl 100. This special type of Polysar gives high resistance to ozone, water, heat and cold; provides excellent dielectric properties; has good flexibility, and is readily processed.

This is only one of many problems which Polymer has helped to solve. Polymer will be glad to help you with your critical rubber problems.



Underwater cable, insulated with Polysar Butyl 100, used by pipeline dredge at Steep Rock Iron Range in Northwestern Ontario.

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Fabrilite 1528 Elastic

A new vinyl-coated upholstery material said to possess remarkable resilience and an all-directional stretch, has been introduced by the "Fabrikoid" division of Canadian Industries,, Ltd., Montreal, Que., Canada. Known as "Fabrilite" 1528 elastic, the material consists of a heavy vinyl coating on a non-woven nylon base which gives it high flex, abrasion and cold-crack resistance as well as unusual flexibility. Both laboratory and field tests have shown that this grade of Fabrilite is the easiest-to-tailor coated fabric yet produced and possesses high stitch-tear strength and balanced stretch. Like all other "Fabrilite" products, it is easily kept clean with a damp cloth.

The new upholstery material will be produced in a wide variety of colors in several embossings and in both dull and the new burnished antique finishes. The manufacturer says that "Fabrilite" 1528 elastic is intended for upholstering furniture for hotels, restaurants, bars, offices, hospitals, institutions and in the home.

Hewitt-Robins Hot Oil Hose

A new hose made of synthetic rubber, steel wire and glass fiber has been developed by Hewitt-Robins, Inc., Stamford, Conn., to handle hot oil used in the construction of asphalt and other tarvia type roads. The hose was developed in response to requests from contractors and government officials for a hose that would withstand the effects of high temperatures, chemically-caused decompositions and rough handling to which road-building equipment is frequently subjected. More than two years of research and testing preceded the decision of Hewitt-Robins to put the hose into full-scale production. Engineers of the company's Buffalo plant who have observed field tests said it out-performs all types of hose previously developed for handling hot road oil. They said it is flexible and relatively light in weight despite its rugged construction. The new hose will be available with inside diameters of ¾, 1, 1½ and 2-inches. The maximum working pressure in each size is 250 pounds per inch.

Krene Plastic Patent

What is said to be the first plastic patent in continuous rolls to be produced in the United States has been announced by the Bakelite Co., New York, N. Y. Made of high-gloss Krene, this classic material for ladies' handbags and fashion accessories, such as belts and wallets, was developed by Bakelite and is being sold to the handbag and allied trades by Fabric Leather Corp., New York, N. Y. Plastic patent in continuous lengths was formerly available only from foreign producers. This new material developed by Bakelite has superior hand, a deeper jet black color, and a dry, uniformity of surface. The dry surface makes a handbag of this material more comfortable to carry in either hot or cold climates. This material retains the usual specially-engineered advantages of Krene, including controlled heat sealing quality. Available in 16, 18 and 20-mil thicknesses, Krene plastic patent is supplied in 60-yard rolls, 48 inches wide.

PLYMOUTH BRAND METALLIC SOAPS

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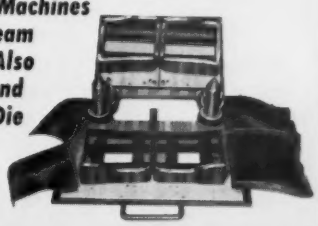

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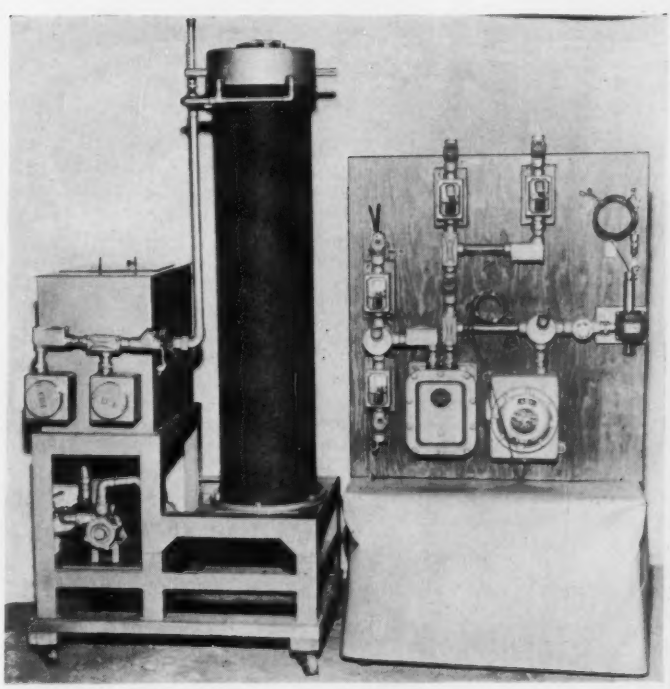

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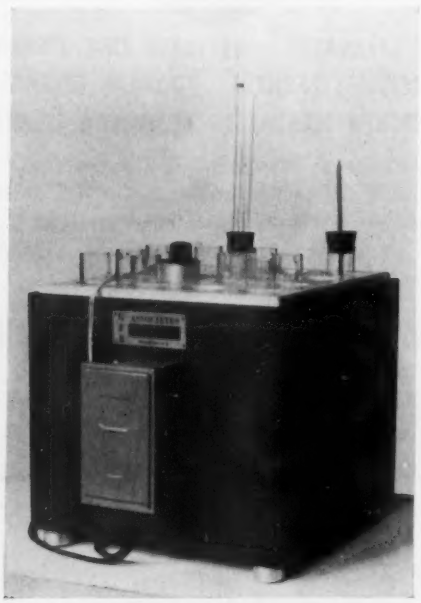
New Equipment

GFB Multicell Heater

Containing individual cells at the same temperature or pressure, the GFB Multicell Heater, manufactured by G. F. Bush Associates, Box 175, Princeton, N. J., is said to overcome the difficulty of cross-migration of volatiles from various substances found in conventional ovens. The unit may be used for many purposes, including heat and air aging, immersion and swelling studies, and effects of temperature and pressure. Glass



specimen tubes can be inserted in the available holes of each heater unit. The heaters can be supplied in any number of cells in any pattern. One cell is used for the thermoregulator. A unit of eight cells is normally supplied, but heaters with any number of cells can also be supplied. All cells, according to the company, are readily accessible from the top of the heater—a specimen tube or bomb can be replaced in a few seconds. It is said that the unit maintains excellent temperature control up to 400°F. with thermometer indication. Operation with any of the cells does not appreciably affect temperature of others, which is not true when the door of a conventional oven is opened only momentarily. Other advantages of the unit are that it presents no fire hazard or dirty equipment found in conventional oil baths. Over-all dimensions of an eight cell unit are about 13 cubic inches with a weight of approximately 20 pounds. It is 115 vac single phase, 60 cycle plug-in. Other models can be supplied on order.

Stearns Magnetic, Inc., Milwaukee, Wisc., has announced the introduction of a new **two-coil electromagnetic pulley** which removes tramp iron on conveyor operations. It is claimed that the new unit produces a more effective flux pattern with a deeper magnetic field at the center of the pulley—a pattern which conforms to normal conveyor load conditions. The two-coil construction is available in a variety of widths and diameters.

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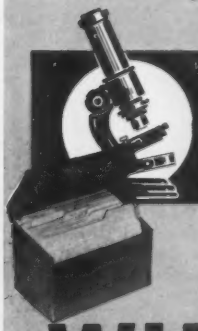
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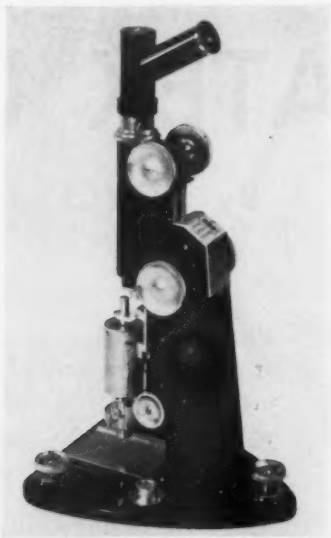
Micro Hardness Tester

A micro hardness tester, sponsored by the International Standards Organization, has been developed by Nash and Thompson, Ltd., Oakcroft Road, Tolworth, Surrey, England. It is based upon a design devised by Dr. Oberto of the Pirelli Rubber Company of Milan, Italy, and is intended for the testing of both large and very small specimens of rubber. The instrument will accommodate specimens from 4 to 45 mm. diameter,



and from 1 to 35 mm. thick. It is possible, under certain conditions, to take readings on samples as small as 2 mm. diameter, and down to ½ mm. thickness. For the hardness testing of large sheets, the mounting slide used for normal measurements is withdrawn, the instrument is placed on the sheet and readings are taken through the base.

The measuring head contains a ball-ended pin, which when loaded sinks into the rubber specimen a distance dependent upon the hardness, and the movement of the upper end of the pin is observed and measured through a microscope. The specimen is located by an annular clamping tube which is free to slide in bearings. The pin itself moves in frictionless bearings located within the clamping tube. The results are compatible with those obtained with the larger British Standard instrument in that the indentation of a small loaded ball, measured in 0.01 mm. units, gives the B. S. hardness number. This number is converted to International Hardness Degrees by reference to the chart in B. S. 903. The tester, which is 16 inches tall, and stands on a base 8 inches square, weighs 15¾ pounds. It can be supplied in polished wooden carrying case.

West Instrument Corp., Chicago, Ill., has introduced a new improved model of their **stepless temperature controller** for use with plastic machinery, electric furnaces, kilns or other electric loads. The controller modulates the power input to an electric load so that heat input is only equal to heat losses. The improved model is said to vary power input load between three and 90 percent automatically, according to demand.

USE THIS ACCELERATOR AT

158° F

If your mill work is colder, you are going to overwork the stock. If you run it hotter, there is danger of scorching. 158 degrees means 158 degrees, not 150 or 162. Use the Cambridge Roll Pyrometer to check the surface temperature of mill, warming and calender rolls. You can do it while rolls are in motion. This is an accurate, quick-acting, rugged instrument that takes the guesswork out of temperature determination. *Needle, Mold and Combination Models also available.*

Send for bulletin 1948.

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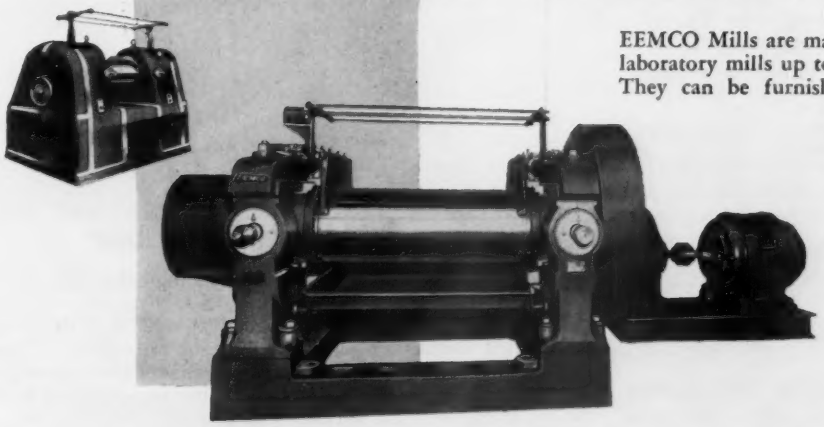

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FOR MECHANICAL ENGINEERS

An advertisement prepared by The Aldrich Pump Co., Member of Hydraulic Institute, U.S.A.

PUMP INSPECTION, MAINTENANCE AND REPAIR are jobs too frequently ignored by pump designers. In a survey of more than 1,500 pump installations, speed and economy of maintenance was frequently quoted as a major factor in pump selection.

SECTIONALIZED FLUID-ENDS offer an excellent means of guaranteeing both speed and economy in pump maintenance. As originated by ALDRICH Pump Co. engineers, fluid ends have only four main assemblies — the working barrel, suction manifold, discharge manifold and stuffing box.

SPEED IN MAINTENANCE comes with ease of accessibility to wearing parts. Manifolds are slid back on studs and valves removed as complete units. Split collar and flange connection of plunger to yoke permit easy removal of plunger.

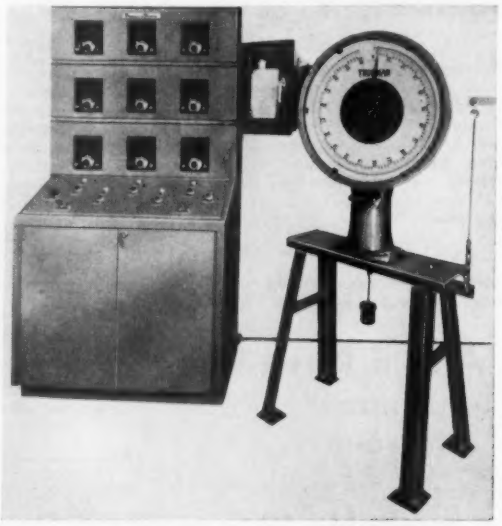
ECONOMY OF MAINTENANCE comes with speed in maintenance. Even more important is the simple fact that it is cheaper to replace a single section than a complete fluid-end. When corrosive liquids are pumped, this is particularly important.

THE DIRECT FLOW PRINCIPLE, utilizing the sectionalized fluid-end, was developed by the ALDRICH Pump Co. Aldrich Engineers have become known as the people to see about your tough pumping problems. We have never turned down a challenge.

FURTHER INFORMATION can be had direct from the company. Tell us your requirements and we'll send you Data Sheets describing the pump we recommend. Address your request to: The Aldrich Pump Co., 25 Gordon Street, Allentown, Pa.

Thurman Electronic Batching System

A new simplified, compact and versatile electronic batching system for such continuous process industries as rubber, plastics and chemicals has been introduced by the Scale Division, Thurman Machine Co., Columbus, Ohio. Providing more rapid weighing of all material for accurate batching, the new Thurma-tronic electronic batching system is adaptable to either accumulative or consecutive weighing. Controls may be set to

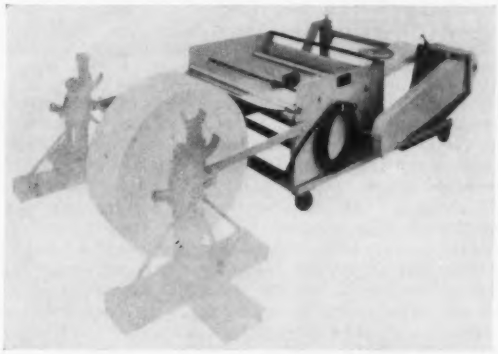


weigh one batch or for completely automatic continuous batching. In addition, controls may also be set to weigh any specific number of batches. It is said that all materials in any formula can be automatically and accurately weighed and transferred from storage bins to mixers and processing machinery without costly handling or time consuming delays. The system's electronic design, according to the company, is unlimited in the number of materials that may be batched in one formula. Moreover, any formula requiring change by the batching operation can be quickly and easily reset to meet production requirements. The system permits a batching cycle to be completed in a matter of seconds and is guaranteed to produce accurately with consistent repetition.

Ralphs-Pugh Beltmaster Junior

For cutting, slitting and rewinding belts, Ralphs-Pugh Co., Inc., 530 Howard St.,, San Francisco 5, Calif., has developed a small economical version of their standard Beltmaster machine. The new machine is known as the Beltmaster Junior, and is designed to slit, cut and rewind belts up to 36 inches in width, 5/8-inch in thickness, and 48 inches in diameter. In use, this machine utilizes the "jacks" that manufacturers or distributors use for raising their belts from the floor to reroll. By fastening these jacks with the attachments furnished, they become the pickup or lift end of the machine, and belts may be slit or rewound automatically. The unit is powered by a heavy-duty gearhead motor.

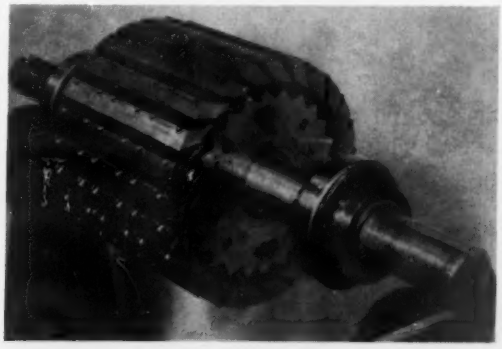
Automatic feed-through is at a constant speed at the slitting table, with the rewind controlled by a slip clutch to compensate for the increasing diameter and speed of the roll. The rewound belt is lowered by a built-in, hand-operated screw-type mechanism. The unit is portable and can be rolled easily to the location of belts.



It can operate in an area of floor space measuring 54 by 112 inches and can be stored in an area 54 by 64 inches. Belt alignment, according to the company, with guides and meter set, is positive and true, with exact length of belt measured in feet and inches. It is said that the lowering mechanism lowers belts up to four feet in diameter and weighing up to 2,000 pounds.

Taylor Stiles Cutting Element

To assure a more positive adjustment of the knives in its new Series 700 high-speed multiple knife plastic cutters, Taylor, Stiles & Company of Riegelsville, New Jersey, has developed a new cutting element. In the



new design, special screws in the saw-shaped piece at each end of the cutting element bear against the bottom surface of the fly knives. When unscrewed with a special wrench, these screws push the fly knives outward for regrinding.

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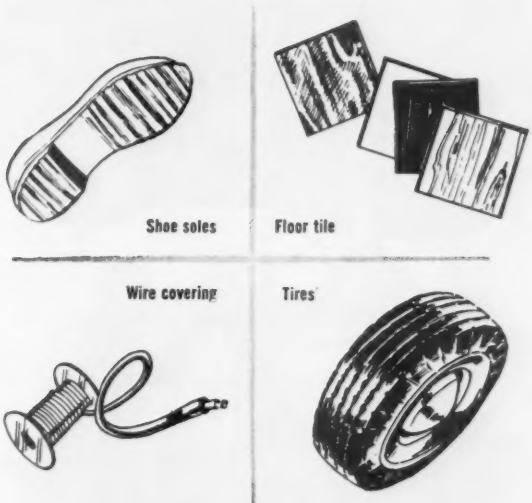

If you compound rubber it will pay you to investigate *low cost* PANAREZ hydrocarbon resins. These softeners are available in any color from Barrett No. 1 to 18, and softening point from 40° F to 300° F. They are supplied in flaked or solid form.

Compounds containing Panarez resins show **IMPROVED COLOR AND COLOR STABILITY . . . IMPROVED EXTRUDABILITY . . . IMPROVED FLEX CRACK PERFORMANCE and ABRASION RESISTANCE . . . IMPROVED OZONE RESISTANCE . . . IMPROVED TEAR RESISTANCE, TENSILE STRENGTH and ELONGATION.**

No change in compounding technique is required when switching to Panarez resins.

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Reviews

BOOKS

The Systematic Identification of Organic Compounds: A Laboratory Manual. (4th Edition). By Ralph L. Shriner, Reynold C. Fuson, and David Y. Curtin. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 5¾ x 8½ in. 448 pp. $6.00.

The latest edition of this book includes reliable procedures for the preparation of numerous useful derivatives of organic compounds, as well as up-to-date discussions of the most important types of organic reactions. To this edition, however, the authors have added a new chapter on infrared and ultraviolet spectroscopy, giving full indications for their use with the common functional groups. The discussion of reaction mechanisms has also been greatly revised and newer theories employed extensively in the treatments of relative reactivities, physical properties, and "solubility" behavior. Subjects covered in the present edition include the identification of unknowns, preliminary examination, determination of physical properties, qualitative analysis for the elements, the solubility classes, application of classification tests, use of spectroscopic methods for functional group determination, the preparation of derivatives, tables of derivatives, the separation of mixtures, and introduction to the solution of structural problems. The book has 13 chapters in all plus an appendix and a cross-referenced subject index.

•

Frontiers in Labor-Management Relations. (Personnel Series No. 164). Published by the American Management Association, 1515 Broadway, New York 36, N. Y. 6 x 9 in. 52 pp. $1.75.

The papers given in this publication were presented at the Personnel Conference of the American Management Association held at the Hotel Statler, New York City, September 26-28, 1955. A discussion of the 1955 Ford-UAW contract and an evaluation of the practicability of supplementary unemployment benefits (SUB) are included in the booklet. Professor Jules Backman of New York University shows what data should be available on supplementary unemployment benefits, and reviews the provisions of various SUB plans. Mr. Malcolm L. Denise, General Industrial Relations Manager, Labor Relations, of the Ford Motor Company gives an authoritative company report on the basic characteristics of the company itself and those of the auto industry which help to shape Ford's labor relations. Another recent development in industrial relations—U.S. Steel's "Joint Plant Tours"—is described by Mr. John Stephens, Vice-President, Industrial Relations, who goes on to present the basic industrial relations philosophy of his company. Finally, Mr. Robert C. Hendon, Vice-President, Operations, Railway Express Agency, Inc., gives a broad picture of the "The Challenge of Tomorrow's Industrial Relations."

•

Plastics Progress: 1955. Edited by Phillip Morgan. Published in the U.S.A. by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. 6 x 9½ in. 448 pp. $17.50.

This book, which is the third volume to appear under the title of "Plastics Progress," contains the full report of the convention which formed part of the British Plastics Exhibition and Convention in 1955. This event is sponsored and organized by *British Plastics*, with the support of the British Plastics Federation. The book brings together some of the more important recent developments and contains chapters under the general headings of polymer structures and properties, expanded plastics, thermoplastics, extrusion, work study and productivity, injection molding, patents, foundry resins, and glass-reinforced plastics. The full texts of the papers are published and in many instances the printed text is substantially longer than the paper which was delivered at the convention. Authors have been allowed to make their points in greater detail, therefore, than was possible on the platform.

BOOKLETS, CATALOGS, etc.

Esami Fotoelastici per lo Studio di Articoli di Gomma (Photoelastic Examinations for Rubber Goods Design). Fattori Accidentali Determinanti Rotture per Fatica in Articoli di Gomma (Accidental Factors Determining Break Fatigue in Rubber Goods). By A. Angioletti. Pirelli Rubber Co., Milano, Italy. 8½ x 11 in. 28 pp. (In Italian).

After a short explanation of the photoelastic method and its applications to transparent plane models of mechanical structures, this report outlines a few methods for the examination of plane models representing sections of rubber articles. Some special cases are considered in the application of the photoelastic law, where it generally results in a quantitative evaluation of stresses in the model. In the second paper (Accidental Factors Determining Break Fatigue in Rubber Goods) the author discusses the photoelastic method with reference to fatigue cracks in rubber. Lack of uniformity in dispersion of leading ingredients, granules and impurities of any kind which upset stress distribution and so cause a local stress concentration are considered as accidental factors determining fatigue cracks in rubber. These factors have been studied after a schematization by means of the photoelastic method. The stress concentration due to a small cut at various positions on a rubber strip is also considered. This case has been treated because fatigue cracks begin normally in this form.

•

Western Potential for the Chemical and Allied Industries. Industrial Department, Chemical Industries Section, San Francisco Chamber of Commerce, San Francisco, Calif. 8½ x 11 in. 14 pp

The purpose of this report is to expand those factors which have led to the conclusion that the San Francisco Bay region does not possess as large a rubber industry as it is capable of supporting. Rubber consumption, value and quantity of important chemicals used by the rubber industry in 1950, and other data pertinent to the industry are given in tabular form. Also given in the report are factors which point to opportunities for rubber plants in the region which includes such items as population trend, motor vehicle registrations, and availability of synthetic rubber. Of interest to the prospective manufacturer in the region is a list of the various types of rubber products that could find a market in the area.

•

Processing Tred 50 and Tred 85 in the Factory. Monsanto Chemicals, Ltd., Victoria St., London S.W. 1, England. 8¼ x 10 in. 12 pp.

Data given in this technical report is based on extensive factory experience with both these high styrene resins in the compounding of resin-rubber soling. Included are typical mixing cycles for both Banbury and open mill with reference to the addition of fillers, resin, wax, accelerators, and color. Brief descriptions of the vulcanization of these materials in soling compounds are also given. The report states that the advantages to be gained by using these resins are good dispersion, short mixing cycles, cool processing temperatures, safe mixing and smooth calendering.

•

Styrene Monomer: Storage and Handling. (Bulletin No. RM-10). Plastics Division, Monsanto Chemical Co., Springfield, Mass. 8½ x 11 in. 6 pp.

The techniques for storing and handling styrene monomer are summarized in this bulletin. A comprehensive list of the chemical's physical properties is included. The bulletin points out that if a few simple precautions are observed styrene monomer can be used and handled safely in any quantity. Considerations which are discussed separately include construction materials, gaskets, filters, insulation, storage life, drum storage and safety precautions.

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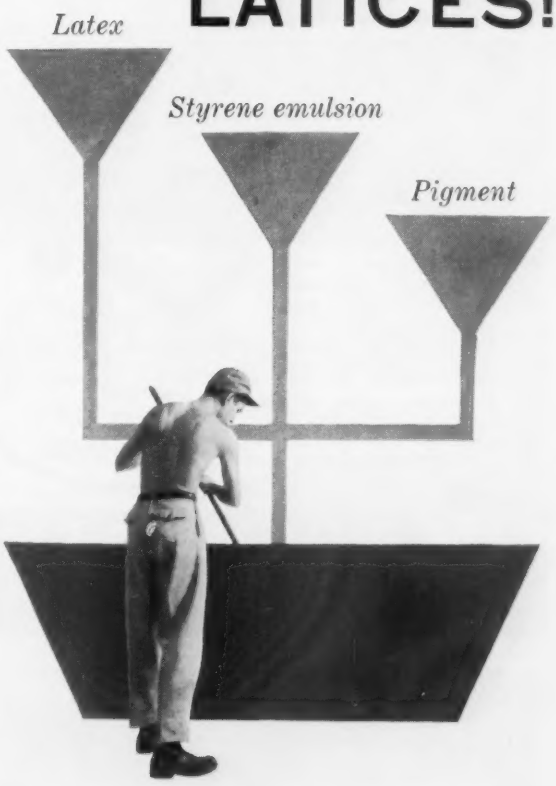

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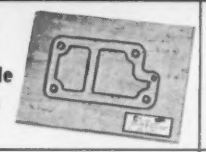
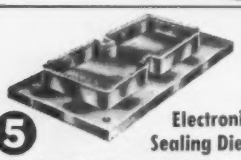
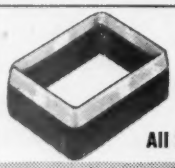


4 Steel Rule Cutting Dies

2 Steel Rule Clicker Dies



5 Electronic Sealing Dies



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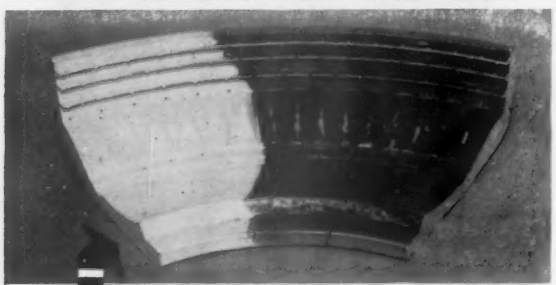

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REVIEWS (CONT'D)

Properties of Rigid and Semi-Rigid Urethane Foams. (Report HR-1). 24 pp. **Chemistry of Organic Isocyanates.** By R. G. Arnold, J. A. Nelson and J. J. Verbanc. (Report HR-2). 40 pp. **Urethane Resilient Foams Made from Polyesters.** By W. J. Remington and R. H. Walsh. (Report HR-10). Elastomers Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in.

DuPont has recently issued three technical reports on urethane foams. In Report HR-1 the foams discussed are made from a single resin-forming recipe but many other recipes can be used. The physical properties of the foams are discussed under the headings of insulating efficiency and mechanical properties. The properties are outlined in charts and tables for quick reference. Report HR-2 briefly discusses the history of isocyanates from 1849 to the present. Also discussed are reactions of isocyanates, polymerization, reaction kinetics, and diisocyanates. A bibliography is included. The fabrication, manufacturing method, chemical reactions, preparation, and physical properties of foams are discussed in Report HR-10. A comparison of the physical properties of polyester foam and rubber latex foam is made using charts to illustrate the various tests.

•

Paracril Cements. By W. E. Galwardy and L. F. Pieroth. (Technical Bulletin No. 9). Naugatuck Chemical Division, U.S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 24 pp.

Included in this technical bulletin are solution and stability properties as well as adhesive film properties of the various types of Paracril rubber. In addition, data is given on cement preparation with reference to equipment, techniques, and storage. A discussion of polymers, pigments, softeners, antioxidants, and curatives used in cement compounds is included. Formulas are shown for self-curing adhesives for vinyl chloride, pressure-sensitive adhesives, adhesives for nylon fabric, adhesives for interior car trim, splice adhesives, and self-curing cements. The bulletin points out that Paracril cements are easily adapted by proper compounding to such bonding applications as plastics, vulcanized and unvulcanized synthetic rubbers, aluminum and other metals, paper, wood, leather, ceramics, and glass.

•

1956 Reference Guide to Dow Corning Silicone Products. Dow Corning Corp., Midland, Mich. 8½ x 11 in. 12 pp.

The company's silicone products that are most generally useful are indexed by type of application and briefly described in this reference guide. Half again as large as last year's, the new edition describes almost 150 of the most generally used silicone products, 18 of which were first introduced within the last twelve months. The products are grouped by physical form (fluids, compounds, greases, resins and rubbers) and cross-indexed by usage (dielectrics, defoamers, damping media, etc.), enabling them to be located by what they do—as well as by what they are. Product descriptions are condensed and devoted to essential data. The guide is illustrated with charts, tables, graphs and application photographs.

•

Tough Enough to Grow. Arapahoe Chemicals, Inc., 2800 Pearl St., Boulder, Colorado. 4 x 6 in. 60 pp.

This booklet tells the story of a new chemical company located off the beaten path. It describes the concern's principal products, the type of work it wants, and its future plans. Short biographical sketches are given of the founders and key administrative personnel. The physical layout of the plant is shown in a full-page photograph preceded by a description of its facilities with regards to research, production and future expansion. Included is a consolidated balance sheet as of December 31, 1954, listing the firm's assets and liabilities. A list of the company's principal products includes such materials as alicylic compounds, Grignard reagents, halogenating agents, scintillation phosphors and related materials, special reagents and miscellaneous compounds.

Hycar Latex Manual. B. F. Goodrich Chemical Co., 2060 East 9th St., Cleveland 15, Ohio. 8½ x 11 in. 98 pp.

The material offered in this manual is intended to supply a comprehensive and reliable source of information about Hycar latices in modern industry. A variety of subjects have been covered including chemical and physical properties of individual latices; evaluation of compounding ingredients and techniques; applications in textiles, papers, leathers, and adhesives, and recommendations for handling and storage. All subject headings have been thoroughly indexed to facilitate quick reference. The illustrated manual also contains data on the tests and test procedures used in evaluating the various latices. The effect of typical thickeners on Hycar latices are shown in tabular form. Specific sections of the manual contain additional information on thickeners related to specific fields. Procedures and formulations helpful in preparing solutions, dispersions and emulsions of the latices are also given.

•

Ethanolamines. Allied Chemical & Dye Corp., Nitrogen Division, 40 Rector St., New York 6, N. Y. 8½ x 11 in. 52 pp.

This technical booklet describes monoethanolamine, diethanolamine, and triethanolamine, listing their applications, chemical and physical properties, physiological properties, shipping specifications, handling and storage features, and a comprehensive bibliography. Complete analytical procedures to determine specific gravity, weight, boiling range, color and odor are given. Illustrations include data pertinent to viscosities, vapor pressure, densities, freezing curves and other characteristics. These materials are characterized by their wide diversity of use in the chemical industry, such as plastics and resins, paints and varnishes, and glues and adhesives.

•

Naugatuck High Quality Synthetic Latex. Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 8 pp.

Specific properties of Naugatex latices, such as total solids concentration, monomer change ratio, pH value, Mooney viscosity, soap type, and particle size, are summarized in this booklet. To facilitate identification during the transition to private operation, the numbering system used in the government program has been retained. Also listed in the booklet are the uses for which each latex was developed, including such applications as asbestos fiber, container sealing, pile fabrics, tire cord dipping, paper saturation, foam sponge, cheming gum and rug underlay.

•

Sixteen Soft Goods Success Stories. Flexible Packaging Materials Division, Bakelite Co., 30 East 42nd St., New York 17, N. Y. 7¼ x 9 in. 12 pp.

This booklet describes why 16 leading manufacturers of soft goods are packaging their products in polyethylene film. It demonstrates the use of this material as both a functional and promotional packaging material for soft goods. The case histories include such products as bed sheets and pillow-cases, children's sleepers, mattress protectors, and shirts. Since the material is tough, flexible, moisture-resistant, and resistant to tearing, the booklet advises that it should stand up well in self-service displays, on shelves and counters.

•

Farrel Speed Reducers. (Bulletin No. 450). Farrel-Birmingham Co., Ansonia, Conn. 8½ x 11 in. 52 pp.

This illustrated booklet contains information about the complete line of Farrel speed reducers, which has been recently reengineered, re-rated and expanded. Included are tables on horsepower ratings, specifications, dimensions, weights, and other data needed for quick selection of speed reducers for various applications. Ratings for the gear units are in accordance with the latest A.G.M.A. standard practice. The booklet also contains brief descriptions on how to use the rating tables, general specifications, selection of gear unit, character of load and service factors.

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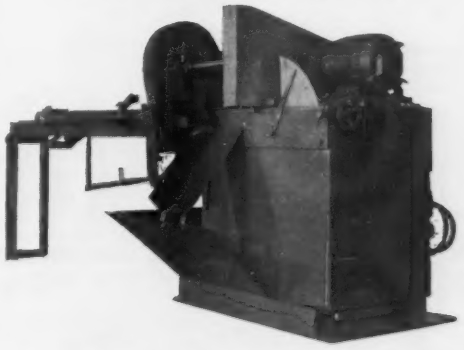

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MARKET REPORTS

TRENDS
NEWS
PRICES

NEW YORK, APRIL 2, 1956

Natural Rubber

Since our last report (March 1), the price of spot rubber on the New York Commodity Exchange has moved in a range of 350 points, high for the period being 35.00c reached on March 5, and low being 31.50c reached on March 27, 29 and again on April 2. The average price of spot rubber for the month of March was 33.68c based on 21 trading days. This compares with the February average of 36.46c.

Many in the trade have now set their sights on 30c rubber for it is felt that at this price buying will be encouraged. The feeling in the trade is that consumers have comparatively modest commitments for more forward delivery, and that a price structure of about 30c should prove to be attractive.

Ceylon to Get U. S. Funds

The State Department, without fanfare, has formally reversed its policy against granting economical and technical aid to Ceylon. The Department has appointed a director for a U. S. aid mission to Ceylon and agreed to supply aid and technical support to assist Ceylon in economic development. It added that up to $5,000,000 would be allocated during the current fiscal year for projects to be agreed upon by the two countries.

The United States had previously refused aid to Ceylon because of its sales of rubber to Communist China. Observers indicate that the new decision may indicate a more moderate administration attitude toward sale of rubber to Red China.

Meanwhile, a Russian freighter was scheduled to arrive at Singapore at the end of March to pick up 6,000 tons of rubber. The consignment is the first purchased by the U. S. S. R. directly from Singapore in four years. Russia stopped direct rubber purchases from the British colony early in 1952 and since then has made her purchases through London buyers.

Since late last year, Russia has been buying from various Singapore firms. Agreement was reached a few weeks ago with a Chinese firm and all Russian purchases in the future will be made only through this firm. An informed European source said an East European rubber expert was expected to be appointed by the Soviets to supervise inspection of the rubber purchased in Singapore.

Production in Belgian Congo

European-owned rubber plantations in the Belgian Congo will be producing 34,000 metric tons of rubber annually by 1960 according to the Union Professionelle des Producteurs de Coutchouc du Congo Belge. Estimates of production for this year are about 27,000 metric tons.

With the exception of a few producers who are not yet well equipped, Belgian Congo rubber products are sold under regulated international standards. Some companies, the Union states, are now specializing in the production of air-dried sheets, for which a group of interested buyers is gradually being formed. Some producers are already establishing plants for the treatment of raw latex.

Price Data

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM MARCH 2 TO APRIL 2

Mar.	Spot	May	July	Sept.	Dec.	Sales
2	33.25	32.90	31.85	31.40	30.80	178
3	....	....	....	....	....	....
4	....	....	....	....	....	....
5	35.00	34.90	33.85	33.25	32.40	265
6	34.75	34.55	33.45	32.75	32.00	209
7	34.25	33.75	32.70	32.10	31.50	282
8	34.50	34.15	33.15	32.60	32.00	114
9	34.50	34.10	33.20	32.55	32.00	462
10	....	....	....	....	....	....
11	....	....	....	....	....	....
12	34.75	34.65	33.55	32.95	32.50	232
13	34.50	34.45	33.30	32.70	32.10	289
14	34.38	34.00	32.95	32.45	31.95	515
15	34.13	33.85	32.85	32.25	31.55	173
16	34.25	34.25	33.25	32.50	32.10	265
17	....	....	....	....	....	....
18	....	....	....	....	....	....
19	34.25	34.05	33.20	32.45	31.80	29
20	34.50	34.10	33.25	32.55	31.90	64
21	34.25	33.80	32.90	32.40	31.60	254
22	33.38	32.85	32.15	31.55	30.85	274
23	32.50	32.40	31.85	31.35	30.50	320
24	....	....	....	....	....	....
25	....	....	....	....	....	....
26	31.75	30.80	30.50	29.75	29.50	380
27	31.50	31.05	30.90	30.35	29.75	566
28	32.38	32.00	31.80	31.10	30.50	331
29	31.50	31.25	31.10	30.45	30.00	242
30	....	....	....	....	....	....
31	....	....	....	....	....	....
Apr.						
1	....	....	....	....	....	....
2	31.50	31.05	30.85	30.40	29.80	98

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.31½
April	.31⅜
May	.31¼
Thin Latex Crepe:	
Spot	.36⅞
Thin Brown Crepe, No. 2	.30½
Flat Bark Crepe	.22½

London Market
(Standard Smoked Sheets)

July-Sept.	30.23 - 30.38
Oct.-Dec.	29.65 - 29.80

Singapore Market
(Standard Smoked Sheets)

May	29.79 - 29.86

Middling Upland Quotations

	Mar. 1	April 2		
	Close	High	Low	Close
May	35.32	35.59	35.50	35.59
July	33.98	33.59	33.45	33.59
Oct.	31.47	32.27	32.16	32.16

Notes and Quotes

John L. Cohill, assistant to the president of the Firestone Tire & Rubber Co., in a recent address before the 17th Annual Highway Conference, stated that rubber will eventually be used in the construction of highways throughout the world. Firestone, he said, has 42 test installations of rubberized asphalt laid during the last eight years. In addition, other companies and organizations have sponsored similar projects so that today there are more than 1,000 miles of this type of highway surface in the United States. The speaker observed that the "most significant fact in connection with this is that to our knowledge, every single yard of this installation has stood up perfectly under the traffic to which it has been exposed since installation."

Synthetic Rubber

According to W. S. Richardson, president of the B. F. Goodrich Co., world consumption of synthetic rubers in 1956 will reach new high tonnage figures exceeding the 1955 record by 100,000 tons or about 10%. "Even though the total use of new rubber of all types in the United States will probably decline about 4% from 1955, due to the anticipated reduction in automobile production, it now appears that 905,000 tons of man-made rubbers will be consumed," Mr. Richardson stated. The nation used 893,000 long tons of synthetic rubber in 1955, he said.

"Now that all the nation's facilities for producing man-made rubber are in the hands of private industry, supplies of the material should be ample throughout the year. The rest of the free world will also set new records this year in the use of man-made rubbers. In 1954, the free world, outside the United States, used only 103,000 tons of man-made rubbers. In 1955 this climbed to 162,000 tons and by the end of 1955 had increased to an annual rate of 200,000 tons. Consumption in 1956 will be about 250,000 tons," he declared.

Sees Increasing Use

Mr. Richardson noted that: "Increasing output of American-made rubbers will make possible increasing use by friendly nations. The United States will be the major source of supply for these versatile materials in 1956," the rubber company official said.

"Usage of tree-grown rubber in the United States is expected to decline to about 550,000 tons, or 80,000 tons under 1955. This will be the lowest consumption of crude rubber since Government consumption controls, imposed at the time of the Korean war, were removed in 1952," Mr. Richardson stated.

According to the Rubber Manufacturers Association, about 183,000 long tons of synthetic rubber were produced in the United States in the first two months of the current year. If production were to continue at this pace, production at year end would total about 1,100,000 long tons.

RMA Consumption Estimates

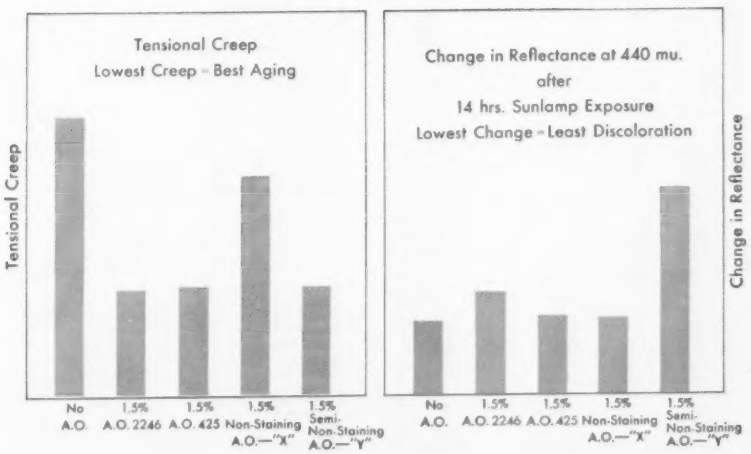
RMA estimates that about 154,000 long tons of synthetic rubber were consumed in the United States in the first two months of this year. In order to hit the consumption figure estimated by Mr. Richardson, consumption for the balance of this year would have to be maintained at the levels set in January and February of this year, about 75,000 long tons a month.

It is interesting to note that for the past few months the percentage of synthetic rubber consumed to total new rubber in the United States has been running at 60%. If this percentage figure should drop because of the continued decline in price of natural, or for some other reason, yearly totals for consumption of synthetic will also fall. While the percentage figure refers only to the United States, natural rubber price declines are most likely to affect synthetic consumption in the rest of the free world.

CYANAMID RUBBER Chem Lines

NO. 4
OF A SERIES

Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey



Rubber stocks containing no antioxidant, and those containing uniform percentages of each of four antioxidants, register varying degrees of resistance to aging and discoloration, as shown above. In both comparative tests, Antioxidant 2246 and Antioxidant 425 provided the best *combined* resistance to aging and discoloration.

Effective Antioxidation Without Discoloration

New uses are being found for products made from rubber every day. Many of these products are designed for use in homes and cars, and as wearing apparel. For such uses the normal black product is usually too drab and does not blend well with the light pastel shades and whites so popular today. This requires that rubber products also be in white or light shades.

These light-colored rubber products must be designed to age well. And since the well-known antioxidants used with black products will discolor or stain, the need for a non-discoloring, yet strong antioxidant is apparent.

Antioxidant 2246® fills this need consistently. It gives excellent protection against oxidation and heat deterioration. In addition, discoloration is minimized and staining is almost nonexistent. The wide acceptance of Antioxidant 2246 in the rubber trade is a testimonial to its value.

However, under certain conditions and in some applications, even the low discoloration tendencies of Antioxidant 2246 are not sufficient. To solve this problem, Antioxidant 425® was developed. Antioxidant 425 causes little or no more discoloration than when no antioxidant is used at all – yet very little, if any, sacrifice is made in its power as an age resistor.

Here, as the charts above show, are two antioxidants for white and light-colored rubber products which offer excellent protection against aging and at the same time keep discoloration at a minimum.

For technical information on Antioxidant 2246, write for Rubber Chemicals Technical Bulletin No. 815; for technical information on Antioxidant 425, write for Rubber Chemicals Technical Bulletin No. 840.

Chemical Progress in Antioxidants

Since 1924, when the first U.S. patent covering age-resistors was issued, many different products have been tried as antioxidants. Today there are about 50 different chemicals in use.

The first really active antioxidants were reaction products of aliphatic aldehydes and primary aromatic amines, known as aldehydeamines. These were soon followed by the secondary aromatic amines such as phenylbetanaphthylamine and ketone-amine reaction products, represented by acetone-aniline reaction products and acetone-diphenylamine reaction products.

Phenylbetanaphthylamine and diphenylamine-acetone reaction products are outstanding antioxidants. However, they discolor rubber badly, particularly when the rubber product is exposed to light, so that they can only be used in black or dark-colored rubber products.

White and light-colored rubber products oxidize in storage or in use. This shortens their service life. In the last 30 years much progress has been made in developing antioxidants which will give minimum discoloration on exposure to light. These materials are usually called "non-staining" or "non-discoloring" antioxidants. The best of them belong to the class of chemicals known as phenols. This is an expanding class of antioxidants, and a number of new chemicals have been added to the list in recent years. Some of these phenolic-type antioxidants give practically no discoloration when the white or light-colored rubber product is exposed to light, but they have little activity as antioxidants. In the last 10 years a number of bis (dialkyl phenols) have been found to be powerful antioxidants which give very little or no discoloration.

Cyanamid has contributed to chemical progress in recent years with the development of Antioxidants 2246 and 425, and through continuing research will develop others.

Chemical Progress Means Rubber Progress

CHEMICAL PROGRESS WEEK · APRIL 23-29

PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER POLYMERS

(dry types—per pound carload unless otherwise specified)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N3	.5800 [2]
Chemigum N5	.5800 [2]
Chemigum N6	.5000 [2]
Chemigum N7	.5000 [2]
Hycar 1001	.5800 [2]
Hycar 1002	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042	.5000 [2]
Hycar 1043	.5000 [2]
Hycar 1312	.6000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril C	.5800 [2]
Polysar Krynac 800	.5000 [2]
Polysar Krynac 801	.5800 [2]
Polysar Krynac 802	.5000 [2]
Polysar Krynac 803	.5000 [2]
Naugapol 1018	.2700 [2]

Butadiene-Styrene Types

Ameripol 1001	.2410 [2]
Ameripol 1002	.2435 [2]
Ameripol 1006	.2410 [2]
Ameripol 1500	.2410 [2]
Ameripol 1501	.2410 [2]
Ameripol 1502	.2410 [2]
Ameripol 1703	.2060 [2]
Ameripol 1705	.2035 [2]
Ameripol 1706	.2035 [2]
Ameripol 1707	.1910 [2]
Ameripol 1709	.1885 [2]
Ameripol 1710	.1885 [2]
Ameripol 1711	.1885 [2]
Ameripol 1712	.1885 [2]
ASRC 1500	.2410 [2]
ASRC 1502	.2410 [2]
Baytown 1600	.1850 [2]
Baytown 1601	.1850 [2]
Baytown 1602	.1850 [2]
Baytown 1801	.1700 [2]
Butaprene S-1000	.2300 [2]
Butaprene S-1001	.2300 [2]
Butaprene S-1004	.2300 [2]
Butaprene S-1006	.2300 [2]
Butaprene S-1009	.2600 [2]
Butaprene S-1010	.2650 [2]
Butaprene S-1012	.2700 [2]
Butaprene S-1013	.2600 [2]
Butaprene S-1015	.2800 [2]
Butaprene S-1500	.2300 [2]
Butaprene S-1502	.2300 [2]
Butaprene S-1703	.1950 [2]
Butaprene S-1705	.1925 [2]
Butaprene S-1710	.1775 [2]
Copo 1500	.2410 [2]
Copo 1502	.2410 [2]
Copo 1712	.1885 [2]
Naugapol 1016	.2650 [2]

Butadiene-Styrene (Cont'd)

Naugapol 1018	.2700 [2]
Naugapol 1019	.2650 [2]
Naugapol 1021	.3000 [2]
Naugapol 1022	.2800 [2]
Naugapol 1023	.2850 [2]
Naugapol 1503	.2700 [2]
Naugapol 1504	.2950 [2]
Philprene 1000	.2500 [1]
Philprene 1001	.2500 [1]
Philprene 1006	.2500 [1]
Philprene 1009	.2550 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1990 [1]
Philprene 1104	.1940 [1]
Philprene 1500	.2500 [1]
Philprene 1502	.2500 [1]
Philprene 1503	.2700 [1]
Philprene 1600	.2000 [1]
Philprene 1601	.1980 [1]
Philprene 1602	.2000 [1]
Philprene 1605	.1940 [1]
Philprene 1703	.2120 [1]
Philprene 1706	.2100 [1]
Philprene 1708	.1970 [1]
Philprene 1711	.1940 [1]
Philprene 1712	.1940 [1]
Philprene 1803	.1790 [1]
Plioflex 1000	.2425 [2]
Plioflex 1006	.2425 [2]
Plioflex 1502	.2425 [2]
Plioflex 1703	.2075 [2]
Plioflex 1710	.1900 [2]
Polysar Krylene	.2410 [2]
Polysar Krylene NS	.2410 [2]
Polysar Krynol	.2000 [2]
Polysar Krynol NS	.2050 [2]
Polysar S	.2410 [2]
Polysar S-50	.2410 [2]
Polysar S-65	.2410 [2]
Polysar S-X 371	.2550 [2]
Polysar SS-250	.3000 [2]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1501	.2300 [2]
S-1502	.2300 [2]
S-1600	.1850 [2]
S-1601	.1850 [2]
S-1602	.1850 [2]
S-1703	.1950 [2]
S-1705	.1925 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1801	.1700 [2]
S-2000	.2275 [2]
S-2101	.2250 [2]
Synpol 1000	.2425 [2]
Synpol 1001	.2425 [2]
Synpol 1002	.2450 [2]
Synpol 1006	.2425 [2]
Synpol 1007	.2425 [2]

Butadiene-Styrene (Cont'd)

Synpol 1009	.2475 [2]
Synpol 1012	.2425 [2]
Synpol 1013	.2500 [2]
Synpol 1500	.2425 [2]
Synpol 1551	.2425 [2]
Synpol 1703	.2075 [2]
Synpol 1707	.1925 [2]
Synpol 1708	.1950 [2]
Synpol 1711	.1900 [2]

Butyl Rubbers

Enjay Butyl 035	.2300 [2]
Enjay Butyl 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [2]
Polysar Butyl 101	.2775 [2]
Polysar Butyl 200	.2450 [2]
Polysar Butyl 300	.2450 [2]
Polysar Butyl 301	.2550 [2]
Polysar Butyl 400	.2450 [2]

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GN-A-P	.3400 [2]
Neoprene Type GN-P	.3400 [2]
Neoprene Type GN-Special	.3400 [2]
Neoprene Type GN-A-Special	.3400 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type W-P	.3400 [2]
Neoprene Type W-Special	.3400 [2]
Neoprene Type WRT	.4500 [2]

Silicone Rubbers

	(prices l.c.l.)
GE (compounded)	2.50 [2]
GE Silicone Gum (not compounded)	4.00 [2]
Silastic (compounded)	1.95 [2]

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.4700 [2]
Thiokol Type FA	.6400 [2]
Thiokol PR-1	.9500 [2]
Thiokol Type ST	1.00 [2]

(latices—all prices per pound dry weight)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [2]
Chemigum 235	.5400 [2]
Chemigum 236	.5400 [2]
Chemigum 245	.4600 [2]
Chemigum 246	.4600 [2]
Hycar 1512	.4600 [2]
Hycar 1551	.5400 [2]
Hycar 1552	.4600 [2]
Hycar 1561	.5400 [2]
Hycar 1562	.4600 [2]
Hycar 1571	.5900 [2]
Hycar 1572	.5100 [2]
Hycar 1577	.4600 [2]

Butadiene-Styrene Types

Butaprene S-2000	.2600 [2]
Butaprene S-2001	.2600 [2]

Butadiene-Styrene (Cont'd)

Butaprene S-2002	.2850 [2]
Butaprene S-2003	.2950 [2]
Butaprene S-2004	.2950 [2]
Butaprene S-2006	.2600 [2]
Copo 2101	.2800 [2]
Copo 2102	.3100 [2]
Copo 2105	.3100 [2]
Copo X-765	.2900 [2]
Pliolite 2101	.3000 [2]
Pliolite 2104	.3200 [2]
Pliolite 2105	.3200 [2]
Pliolite X-765	.3000 [2]
Naugatex 2000	.2630 [2]
Naugatex 2001	.2630 [2]
Naugatex 2002	.2880 [2]
Naugatex 2005	.3000 [2]
Naugatex 2006	.2630 [2]
Naugatex 2101	.2850 [2]
Naugatex 2105	.3120 [2]
Naugatex X-767	.3230 [2]

Butadiene-Styrene (Cont'd)

S 2000	.2275 [2]
S 2004	.2600 [2]
S 2101	.2250 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [2]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid.

MARKETS (continued)

Reclaimed Rubber

Reclaimers report slower activities during the past few weeks. It is expected that with accelerated spring production in the automobile industry, there may be some quickening of activity in reclaimed rubber. Snow storms throughout the Eastern portions of the United States during past weeks also tended to impede activities of reclaimers.

Preliminary figures available from the U. S. Department of Commerce indicate that 26,204 long tons of reclaimed rubber were produced in January of this year. RMA estimates that 26,106 long tons were produced in February. Were this productive pace to continue for the balance of the year, some 310,000 long tons would be produced. This figure would be only 15,000 long tons less than in the year before. Current prices for reclaimed rubber follow:

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11
First Line Whole Tire	.10½
Second Line Whole Tire	.10
Third Line Whole Tire	.09¾
Fourth Line Whole Tire	.09¼
Black Carcass	.14¾
No. 1 Light Colored Carcass	.20¾
No. 1 Peel	.11
Butyl Tube Reclaim	.15
Natural Rubber Black Tube	.15
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

Snow storms which hit the greater part of the East during the latter weeks of March severely crippled movements of scrap rubber. Dealers were generally working on filling their commitments for March-April delivery. The tube section of the market continues on the quiet side and quotations for Butyl tubes have generally been reported as nominal by the trade.

Figures now available from the Bureau of the Census indicate that in the first eleven months of 1955, scrap rubber exports totaled 33,932,951 pounds valued at $1,148,674. In all of 1954, scrap rubber exports amounted to 30,558,059 pounds valued at $763,228. Current prices for scrap rubber follow:

(Prices Delivered Akron)

Mixed tires	ton	18.00
Light colored carcass	lb.	.05¼
No. 1 peelings	ton	45.00
No. 2 peelings	ton	30.00
No. 3 peelings	ton	21.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	20.00
Passenger S.A.G.	ton	17.50
Natural Rubber Red Tubes	lb.	.07½
Natural Rubber Black Tubes	lb.	.06½
Butyl Rubber Tubes	lb.	.05

Tire Fabrics

A series of price cuts in rayon and nylon tire cord may presage the beginning of a long struggle between the two commodities for control of the $300,000,000 a year tire cord market. As the score now stands, the rayon industry sells about 420,000,000 pounds of tire cord a year. Nylon accounts for another 50,000,000 pounds, and has been moving up quickly in recent months.

In an industry that needs more than 450,000,000 pounds of cord a year to keep going, it would take many years for nylon plant capacity to catch up, even if it had been decided by the tire companies that nylon was the most suitable. Moreover, many rayon producers have already introduced, or shortly plan to introduce, new high tenacity yarns. These new yarns may serve to hold nylon back for a few more years, many producers believe.

1955 Tire Cord Output

The Textile Economics Bureau reports that output of all types of tire cord and fabric in 1955 totaled 523,000,000 pounds, which compares with 414,000,000 pounds in 1954. The respective 1954 and 1955 annual total poundages, together with the percent change were as follows:

Rayon tire cord and fabric, 324,000,000 and 406,000,000 pounds (+25%); nylon tire cord and fabric, 30,000,000 and 50,000,000 pounds (+67%); cotton tire cord and fabric (excluding chafer) 13,000,000 and 16,000,000 pounds (+23%); and cotton chafer fabric 47,000,000 and 51,000,000 pounds (+9%).

Coated Nylon Tarpaulins

Some in the trade see the eventual replacement of cotton duck by coated nylon in the truck tarpaulin field. The tarpaulin industry has been going through a period of experimentation with many types of fabrics, coatings and fabrication methods during the past few years.

According to one producer, vinyl-coated center sections with neoprene coated front and back sections make the most serviceable tarpaulins. It was also stated that rubber tie-downs to speed up fastening and to reduce wind whipping are desirable.

Although the initial cost of producing coated nylon tarpaulins is higher than the cost of producing treated cotton duck, it is indicated that the total cost is less when such factors as longer life, fewer repairs, ease of handling, and increased pay load because of less weight are taken into consideration.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.76
1650	lb.	.70
2200	lb.	.70½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

1100	lb.	.72
1650	lb.	.66½
2200	lb.	.66

Cotton Chafers

14.4 oz. (per square yard)	lb.	.70
9.25 oz. (per square yard)	lb.	.65
11.65 oz. (per square yard)	lb.	.61
8.9 oz. (per square yard)	lb.	.67

Liquid Latex

Natural: The Rubber Manufacturers Association estimates that 7,935 long tons of Hevea latex were in new supply in February and 8,865 in January. The February figure is the highest since September of 1955, when 8,109 long tons of Hevea latex were in new supply. During the past few weeks Hevea latex prices, in bulk, have ranged from 37 to 38c per pound, East Coast port.

As for consumption of Hevea latex, RMA estimates that 6,567 long tons were consumed in January and 5,930 long tons in February. As of February 29, there were said to be 16,658 long tons of Hevea latex on hand, the highest figure in many years. This may account for trade reports of a sliding market within past weeks.

Synthetic: Prices for butadiene-styrene latices remain firm, ranging from 22.50c to 32.30c per pound. These price levels have held for the past few months and the trade is of the opinion that there is nothing in the wind to indicate any sudden fluctuation, either up or down.

Preliminary figures from the Department of Commerce indicate that 6,770 long tons of butadiene-styrene latices were produced in January of this year and 6,126 long tons consumed. The Department advises that 848 long tons of neoprene latex were produced in January and 781 long tons consumed. As for N-type, the Department states that January production was 919 long tons and consumption was 725 long tons.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the extremely narrow range of 25 points since our last report (March 1), high for the period being 36.85c reached on March 23 and again on March 24, and low being 36.60c reached on March 5, 6, 7, 8, 12, 13 and 14. The average price of middling uplands for the month of March was 36.70c based on 21 trading days. This compares with an average of 36.26c in the previous month.

There is said to be considerable confusion in Indian cotton circles about the way United States authorities are dealing with their cotton surplus disposal plan. Not only is the 1956 cotton surplus price still under debate in the U. S. Congress, but nothing definite is known of the scope, timing and selling terms of the enlarged Commodity Credit Corp. sales program which is supposed to come into operation soon.

Meanwhile, the U. S. market is hesitating, because of the uncertainty about farm legislation and the effect of the export program. While the trade is urging an export subsidy, an export sales plan on a competitive bid basis is expected to be initiated. It is difficult to tell what effect this program will have. The government has indicted eight cotton firms for violating the anti-trust laws, but the government itself has almost a complete monopoly of the cotton available—controlling about 80% of the supply. Repossessions from loan stock is only moderate, and it is conceded, in some quarters, that the present rate of consumption will necessitate heavier repossessions before July or before the new crop begins to move.

CURRENT MARKET PRICES

of rubber chemicals and compounding ingredients

APRIL 2, 1956

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

***Trademark. †For Export Only.**

The arrangement of this section closely follows the Chemical Section of the 1955-56 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.72	-	.79
A-32*	lb.	.66	-	.80
A-100*	lb.	.52	-	.66
Accelerator No. 8*	lb.	—	-	1.10
Accelerator—49*	lb.	.55	-	.56
Accelerator 89*	lb.	—	-	1.20
Accelerator 108*	lb.	—	-	.90
Accelerator—552*	lb.	—	-	2.25
Accelerator—808*	lb.	.66	-	.68
Accelerator—833*	lb.	1.17	-	1.19
Accelerator B*	lb.	—	-	.89
Altax*	lb.	.50	-	.52
Ancap*(†)	lb.	.38	-	.40
Ancatax*(†)	lb.	.48	-	.50
Ancazate BU (ET & ME)*(†)	lb.	—	-	1.07
Ancazide ET*(†)	lb.	—	-	1.07
ME*(†)	lb.	—	-	1.14
Arazate*	lb.	—	-	2.25
Beutene*	lb.	.66	-	.68
Bismate, Rodform*	lb.	—	-	3.00
Butazate*	lb.	—	-	1.04
Butyl Eight*	lb.	1.10	-	1.35
Captax*	lb.	.40	-	.42
C-P-B*	lb.	—	-	1.95
Cumate, Rodform*	lb.	—	-	1.45
Diorthotolylguanidine	lb.	.60	-	.61
Diphenylguanidine	lb.	.50	-	.57
El-Sixty*	lb.	.58	-	.65
Ethazate*	lb.	—	-	1.04
50D*	lb.	—	-	.85
Ethyl Thiurad*	lb.	—	-	1.04
Ethyl Tuex*	lb.	—	-	1.04
Ethylac*	lb.	.93	-	.95
Guantal*	lb.	.58	-	.65
Harvex*	lb.	.70	-	.76
Hepteen Base*	lb.	—	-	1.85
Kure-Blend MT*	lb.	—	-	.70
Ledate, Rodform*	lb.	—	-	1.04
MBT-XXX*	lb.	.51	-	.53
Merac*	lb.	.75	-	1.05
Mercaptobenzothiazole	lb.	.40	-	.42
Mercaptobenzothiazyl Disulfide	lb.	.50	-	.52
Mertax*	lb.	.51	-	.58
Methazate*	lb.	—	-	1.04
Monex*	lb.	—	-	1.14
Mono Thiurad*	lb.	—	-	1.14
Morfex*	lb.	.65	-	.67
2-MT	lb.	—	-	1.00
NA-22* (for neoprene)	lb.	—	-	1.00
NOBS No. 1*	lb.	.72	-	.74
Special*	lb.	.77	-	.79
O-X-A-F	lb.	.51	-	.53
Pentex*	lb.	—	-	1.04
Flour*	lb.	—	-	.21
Permalux (Neoprene)*	lb.	—	-	2.17
Phenex*	lb.	.52	-	.57
Polyac*	lb.	—	-	1.80
R-2 Crystals*	lb.	—	-	4.35
Rotax*	lb.	.51	-	.53
RZ-50-A*	lb.	—	-	1.00
B*	lb.	—	-	1.00
SA 52*	lb.	—	-	1.14
SA 57*	lb.	—	-	1.04
SA 62*	lb.	—	-	1.04
SA 66*	lb.	—	-	4.25
SA 67*	lb.	—	-	1.04
SA 77*	lb.	—	-	1.04
Santocure*	lb.	.72	-	.79
NS*	lb.	.78	-	.85
Selenac* (Ethyl, Methyl)	lb.	—	-	4.25
Setsit-5*	lb.	.75	-	1.05
9*	lb.	.85	-	1.15
SPDX-GH*	lb.	.69	-	.71
GL*	lb.	1.20	-	1.30
Tellurac*	lb.	—	-	1.45
Tepidone*	lb.	.45	-	.48
Tetrone A*	lb.	—	-	1.91
Thiofide*	lb.	.50	-	.57
S*	lb.	.52	-	.59
Thionex*	lb.	—	-	1.14
Thiotax*	lb.	.40	-	.47
Thiurad*	lb.	—	-	1.14
Thiuram E*	lb.	—	-	1.04
M*	lb.	—	-	1.14
Trimene*	lb.	.56	-	.58
Base*	lb.	1.03	-	1.06
Triphenyl Guanidine	lb.	—	-	.90
Tuads* (Ethyl)	lb.	—	-	1.04
Tuads* (Methyl)	lb.	—	-	1.14
Tuex*	lb.	—	-	1.14
Ultex*	lb.	1.00	-	1.10
Unads*	lb.	—	-	1.14
Vulcacure NB*	lb.	—	-	.45
ZB*	lb.	—	-	.85
ZE*	lb.	—	-	.85
ZM*	lb.	—	-	.85
Z-B-X*	lb.	—	-	2.45
Zenite*	lb.	.50	-	.52
A*	lb.	.59	-	.61
Zenite Special*	lb.	.51	-	.53
Zetax* (uncoated)	lb.	.51	-	.53
Zimate* (Butyl)	lb.	—	-	1.04
Zimate* (Ethyl)	lb.	—	-	1.04
Zimate* (Methyl)	lb.	—	-	1.04

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.17¼	-	.18¼
Cottonseed Fatty Acids				
Wochem 210*	lb.	—	-	.15¾
211*	lb.	—	-	.15¾
Fish Oil, Hydrogenated, Fatty Acid				
DAR-S* (dlvd.)	lb.	.12½	-	.14½
DAR-HY* (dlvd.)	lb.	.14¼	-	.16¼
Hydrofol Acids* (dlvd.)	lb.	.15¼	-	.17¼
Hyfac 430* (dlvd.)	lb.	.16¾	-	.18¾
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	-	.15¾
Neutrex* (dlvd.)	lb.	.15	-	.17
Stearex Beads* (dlvd.)	lb.	.09¾	-	.10¾
Stearite*	lb.	.12	-	.14
Talene* (dlvd.)	lb.	.15¼	-	.17¼
Lime, Hydrated				
Arrowhead*	ton	—	-	21.00
Marblehead*	ton	—	-	17.00
Sierra*	ton	—	-	22.50
Litharge				
Eagle-Picher*	lb.	—	-	.18½
SB* (dlvd.)	lb.	—	-	.18½
Magnesium Oxide, Heavy				
General Magnesite 500*	lb.	.05	-	.05½
600*	lb.	.05½	-	.06
Kaiser 325*	lb.	.057	-	.073
Michigan No. 15*	lb.	.06	-	.06½
Magnesium Oxide, Light				
Baker's* (neoprene grade)	lb.	.25¼	-	.26
Carey Mag*	lb.	.25¼	-	.26
General Magnesite* (neoprene grade)	lb.	.29¼	-	.30

ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)				
General Magnesite No. 101*	lb.	.25¼	-	.28
Genmag ML*	lb.	.25¼	-	.28
K & M* (neoprene grade)	lb.	.29¼	-	.30
Light Calcined Magnesia No. X-01*	lb.	.25¼	-	.26
Light Carbonate of Magnesia, Technical	lb.	.10½	-	.12
Maglite D*	lb.	.25¼	-	.26
L and M*	lb.	.29¼	-	.30
Marine's* (neoprene grade) (l.c.l.)	lb.	.29¼	-	.30
Michigan No. 30*	lb.	.25¼	-	.26
Neomag Powder*	lb.	.29¼	-	.30
Pellets*	lb.	.31¼	-	.32
Michigan No. 40*	lb.	.29¼	-	.30
Oleic Acid				
Emersol 210* (dlvd.)	lb.	.18½	-	.20½
Groco Red Oil*	lb.	.18	-	.20
Neo-Fat 92-04*	lb.	.18	-	.19¾
94-04*	lb.	.15½	-	.17½
Wochem 310, 311	lb.	—	-	.18½
Palm Fatty Acids				
Groco 45*	lb.	.14¼	-	.16¼
Wochem 280*	lb.	—	-	.14¾
281*	lb.	—	-	.14¾
Potassium Oleate (dms.)	lb.	.30	-	.73
Red Lead				
Eagle-Picher*	lb.	—	-	.18½
No. 2 RM* (dlvd.)	lb.	—	-	.18½
Sodium Laurate, 75%	lb.	.64	-	.89
Sodium Oleate, 75%	lb.	.54	-	.79
Paste (dms.)	lb.	.39	-	.64
Sodium Stearate, 75%	lb.	.54	-	.89
Stearic Acid, Single Pressed				
Emersol 110* (dlvd.)	lb.	.14¾	-	.16¾
Groco 53*	lb.	.14¼	-	.16¼
Neo-Fat 18-53*	lb.	.13¾	-	.14¾
Standard Pearlstearic* (dlvd.)	lb.	.14¼	-	.16¼
Wochem 730*	lb.	—	-	.12½
Stearex B* (dlvd.)	lb.	.15½	-	.16¾
Stearic Acid, Double Pressed				
Choice Pearlstearic* (dlvd.)	lb.	.15¼	-	.17¼
Emersol 120* (dlvd.)	lb.	.15¼	-	.17¼
Groco 54*	lb.	.14¾	-	.16¾
Hydrofol Acid 51RG	lb.	.12½	-	.14½
Neo-Fat 18-54*	lb.	.14¼	-	.15¼
Wochem 731*	lb.	—	-	.13¾
Stearic Acid, Other				
Extra Pearlstearic* (dlvd.)	lb.	.17½	-	.19½
Groco*	lb.	.12	-	.14
Neo-Fat 18*	lb.	.17½	-	.18½
18-58*	lb.	.12	-	.13
18-61*	lb.	.15¼	-	.16¼
Stearite*	lb.	.12½	-	.14½
Wochem 720*	lb.	—	-	.11¾
721*	lb.	—	-	.11¾
732*	lb.	—	-	.14¾
White Lead Basic Carbonate	lb.	.19	-	.20
White Lead Basic Sulfate	lb.	.17¼	-	.18¼
Zinc Laurate				
Laurex*	lb.	.33	-	.34
Zinc Stearate	lb.	.39	-	.44
Aquazinc K.C.*	lb.	.30	-	.55
Crown Brand*	lb.	.39	-	.44

Unclassified Activators

Actifat* (dms.)	lb.	—	-	.18
Aktone*	lb.	.21¼	-	.23¼
Barak*	lb.	—	-	.62
Curade*	lb.	.57	-	.59
Dibenzo G-M-F	lb.	—	-	2.60
D-B-A*	lb.	—	-	1.95
G-M-F*	lb.	—	-	2.60
Dibutylamine (dlvd.)	lb.	.55	-	.56
MODX*	lb.	.32½	-	.34½
Ridacto* (dms.)	lb.	.25	-	.26
Snodotte* (dlvd.)	lb.	.19	-	.21
Vulklor*	lb.	.88	-	.98

ANTI-COAGULANTS

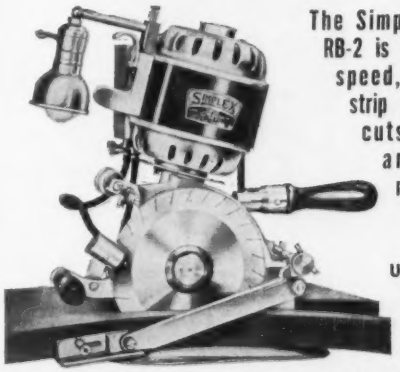
Aqua Ammonia* (dms.)	lb.	.031	-	.035
M.B.M.* (l.c.l.)	lb.	—	-	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H*	lb.	—	-	.20
Regular*	lb.	—	-	.12
Anhydrol 6991*	lb.	.51	-	.56
D.C. Antifoam A*	lb.	5.45	-	6.65
Antifoam A Emulsion*	lb.	2.05	-	4.00
Antifoam AF Emulsion*	lb.	2.05	-	2.85
Defoama W-1701*	lb.	—	-	.12½
Defoamer A-25*	lb.	—	-	3.00
Defoamer 630*	lb.	—	-	.12½
Deltyl Prime	lb.	.70	-	.80

SIMPLEX
REG. TRADE MARK

CUT 2500 FEET OF STRIP PER HOUR



The Simplex Model RB-2 is a new high speed, portable strip cutter that cuts efficiently and accurately.

U. S. Patent 2,294,497

The new Model RB-2 has a maximum cutting thickness of two inches, weighs 44.5 pounds, and is available in both A.C. and D.C. types. Manually operated, the machine is capable of cutting up to 20,000 feet of rubber strip in eight hours. A series of slits in the edge of the cutting blade carries water from a reservoir into the cut and not just to the top of the rubber being cut. This method lubricates the entire cut and produces a straight and even edge.

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Manufacturers of a Complete Line of Cloth Cutting Machinery

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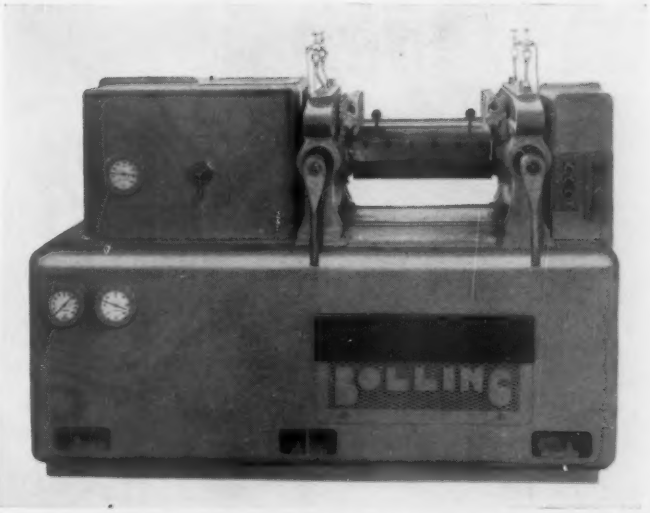
Ask on your letterhead for Bulletin A-4.



Ten Bolling laboratory mills in sizes from 6" x 16" to 16" x 36" were installed during 1955 in the world's largest and most modern rubber laboratory. One of these mills, an 8" x 20" deluxe model, is shown above.

STEWART BOLLING & COMPANY, INC.

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• INTENSIVE MIXERS AND MILLS • CALENDERS • REFINERS • CRACKERS HYDRAULIC PRESSES • PUMP UNITS BALE SLITTERS • SPEED REDUCERS

ANTI-FOAMING AGENTS (Cont'd)

Emcol IM*	lb.	——	.60
G-E Antifoam SS-24*	lb.	5.30	6.65
SS-60*	lb.	2.05	3.75
SS-66*	lb.	5.30	6.65
Kessco X-3* (dms.)	lb.	——	.35½
X-180*	lb.	——	.29¾
X-181*	lb.	——	.38½
Nopco 1407*	lb.	.19½	.20½
1497-V*	lb.	.13¼	.14¼
1907-B*	lb.	.18¼	.19¼
JMK*	lb.	.48	.49
JMU*	lb.	.22½	.23½
JMY*	lb.	.19¼	.20¼
Pluronic L61*	lb.	.33½	.39
RS-968*	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.35	.50
Tributyl Phosphate (dms.)	lb.	.52	.53

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	2.00
AgeRite Alba*	lb.	2.35	2.45
Gel*	lb.	.64	.66
Hipar*	lb.	.98	1.00
H.P.*	lb.	.72	.74
Powder*	lb.	.52	.54
Resin*	lb.	.75	.77
Resin D*	lb.	.52	.54
Spar*	lb.	.52	.54
Stalite*	lb.	.52	.54
Stalite S*	lb.	.52	.54
Superlite*	lb.	.52	.54
White*	lb.	1.45	1.55
Akroflex C*	lb.	.77	.79
CD*	lb.	.72	.74
Aminox*	lb.	.52	.54
Antioxidant 425*	lb.	2.47	2.50
Antioxidant 2246*	lb.	1.50	1.53
Antox*	lb.	.52	.54
Aranox*	lb.	——	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special*	lb.	.80	.82
B-L-E*	lb.	.52	.54
B-X-A*	lb.	.52	.54
Deenax*	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.91	.95
Eugenol C-95%*	lb.	2.30	2.50
Flectol H*	lb.	.52	.59
Flexamine*	lb.	.72	.74
Ionol* (dms.)	lb.	.91	.95
Neozone A*	lb.	.56	.58
C*	lb.	——	.80
D*	lb.	.52	.54
Nullapon BF-12*	lb.	——	.21½
BF-13*	lb.	——	.29
BF-78*	lb.	——	.62
BF-Acid*	lb.	——	.97½
Octamine*	lb.	.52	.54
Oxidex*	lb.	——	3.60
PDA-10*	lb.	.46	.48
Permalux*	lb.	——	2.17
Polygard*	lb.	.52	.54
Santoflex AW*	lb.	.78	.85
DD*	lb.	.52	.59
75*	lb.	.92	.99
Santovar-A*	lb.	1.50	1.57
Santowhite Crystals*	lb.	1.60	1.67
Santowhite L*	lb.	.52	.59
MK*	lb.	1.29	1.36
Powder*	lb.	1.60	1.67
Sequestrene AA*	lb.	——	.97½
NA2*	lb.	——	.79½
NA3*	lb.	——	.77½
Stabilite*	lb.	.55	.57
Alba*	lb.	.72	.77
FLX*	lb.	——	.65
L*	lb.	.60	.62
White*	lb.	.52	.54
White Powder*	lb.	.41	.43
Stabilizer No. 1*	lb.	1.55	1.80
Stabilizer No. 9-A*	lb.	.80	1.05
Styphen I*	lb.	.51	.55
Sunolite*	lb.	.16	.22
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex A*	lb.	.98	1.00
V-G-B*	lb.	.70	.72
Wing-Stay S*	lb.	.51	.53

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.31	.33
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder W*	lb.	——	.45
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	.38
Arquad S*	lb.	.24	.26
Formaldehyde (dms.)	lb.	.06	.076
G-4* (bbls.)	lb.	1.09	1.29
G-11*	lb.	1.98	2.08
Halane*	lb.	.50	.60
Nuodex 100 S.S.* (dlvd.)	lb.	——	1.10
100 W.D.* (dlvd.)	lb.	——	1.25
Zinc 8%* (dms.) (dlvd.)	lb.	.24	.28
Ortho Cresol (26°—27°)	lb.	.14	.156
Retarder D*	lb.	.42	.50
Soligen Drier—Copper 8%* (dms.)	lb.	.20¼	.21½
Zinc 8%* (dms.)	lb.	.22¼	.23½
Vancide*	lb.	——	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.13	6.50
Webnix 34*	lb.	1.25	2.25

AROMATICS (DEODORANTS)

Airkem 115*	gal.	——	6.50
122*	gal.	——	6.50
186*	gal.	——	6.50
Alamask AA*	lb.	——	3.00
AF*	lb.	——	2.50
AO*	lb.	——	1.50
AR*	lb.	——	.50
BG*	lb.	——	1.15
BGM*	lb.	——	.60
CY*	lb.	——	2.40
DI*	lb.	——	3.35
DL*	lb.	——	1.95
H*	lb.	——	5.50
LD*	lb.	——	.75
ND*	lb.	——	2.75
O*	lb.	——	6.50
OS*	lb.	——	5.25
Bouquet 149*	lb.	——	3.00
Coumarin*	lb.	2.95	3.00
Curodex 19*	lb.	4.75	4.90
188*	lb.	5.75	5.90
198*	lb.	6.75	6.90
Deodorant 65*	lb.	——	1.85
Deodorant L-37*	lb.	2.00	2.40
L-44*	lb.	2.50	2.90
N.L.T.X.*	lb.	1.85	2.15
Deodorant Oil GD 6422*	lb.	1.90	2.20
GD 6423*	lb.	1.60	1.90
GD 6575*	lb.	2.40	2.90
GD 31063*	lb.	2.25	2.75
Ethavan*	lb.	6.75	6.80
Latex Perfume 5*	lb.	——	3.25
6*	lb.	——	7.50
9*	lb.	——	1.25
Naugaromes* (dms.)	lb.	.60	3.00
Neutroleum Delta*	lb.	——	2.60
Gamma*	lb.	——	3.60
Parador A*	lb.	1.80	2.10
C*	lb.	2.00	2.50
E*	lb.	.25	.40
GD 5280*	lb.	2.00	2.50
GD 53481*	lb.	1.70	2.00
Perfume Oil Bouquet Vanilla M*	lb.	2.40	2.75
Rodo No. 0*	lb.	4.00	4.50
No. 10*	lb.	5.00	5.50
Rubbarome* (dms.)	lb.	.60	3.80
Rubber Perfume 12*	lb.	——	4.35
Russian Leather 7*	lb.	——	4.35
Vanillin	lb.	3.00	3.25

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	——	8.00
Better Blend Soda* (c.l. bags)	cwt.	——	2.40
Blowing Agent CP-975*	lb.	.32	.35
Celogen*	lb.	——	1.95
AZ*	lb.	——	1.95
Diazo Amino Benzine	lb.	——	.73
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	2.30
Sponge Paste*	lb.	——	.20
Unicel ND*	lb.	——	.76
S*	lb.	——	.20
Urea	lb.	.06	.07

BONDING AGENTS

Base 6986*	lb.	.27	.32
Braze*	gal.	6.00	9.00
Cover Cement*	gal.	2.50	4.00
Durez 12987*	lb.	——	.54
Gen-Tac Latex*	lb.	.75	.85½
Hylene M*	lb.	3.50	3.75
M-50*	lb.	1.90	2.15
Penacolite B1A*	lb.	——	.95
R-2710*	lb.	——	.95
Pliobond 20*	gal.	2.91	4.23
30*	gal.	3.65	4.97
Rex Compounds*	gal.	1.30	1.90
Thixons*	gal.	3.30	9.00
Ty-Ply O (BN & S)*	gal.	6.75	8.00
Tygobond 30*	gal.	5.50	7.45

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.50	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Flake	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	——	.084
Zinc Nitrate, Tech. Flake	lb.	——	.22½

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	.10¼
M*	lb.	.10½	.11
R*	lb.	.10¾	.11¼
S*	lb.	.11¾	.12¼
Black Shield 4-35* (dms.)	lb.	——	.09
No. 5	lb.	——	.093
No. 6	lb.	——	.09
No. 14	lb.	——	.11
Carbon Black See *Reinforcing Agents*			
Lampblack No. 10*	lb.	.06	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¼	.14½
Pure Black Iron Oxide	lb.	.14¾	.14½

COLORING AGENTS (Cont'd)

Blue

Blue Powders	lb.	2.30	5.00
Cooke M.B. Blue*	lb.	2.45	2.85
Milori Blue*	lb.	——	.52
Monastral Rubber Blue CPL*	lb.	——	1.95
PCD, Dispersed*	lb.	——	2.20
Peacoline Blue*	lb.	——	3.85
Ramapo Blue*	lb.	2.75	3.00
Rubber Blue GD* (Disp.)	lb.	——	4.55
Rubber Blue X-1999*	lb.	——	1.80
Rubber Dispersed Blues	lb.	2.52	2.78
Syntheline Blue*	lb.	——	3.85
Stan-Tone MBS*	lb.	1.55	4.55
GPE*	lb.	——	2.50
PC*	lb.	1.40	1.80
Ultramarine	lb.	.14	.30
Vansul Blue M.B.*	lb.	.95	2.60

Brown

Brown Iron Oxide	lb.	.15¼	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¼	.15½
Stan-Tone GPE*	lb.	——	3.00
Vansul Brown M.B.* (Organic)	lb.	——	2.15

Green

Cooke M.B. Green*	lb.	1.45	2.80
Filo Green*	lb.	——	.34
Green Chromium Oxide, Pure	lb.	——	.42½
Green Chromium Oxide, Pure Hydrated	lb.	——	1.15
Green Powders	lb.	1.35	3.95
Monastral Rubber Green GSD* (Dispersed)	lb.	——	2.66
GSL*	lb.	——	2.20
Permansa Green CP-594*	lb.	——	1.35
Pigment Green B*	lb.	——	1.35
GL-652D*	lb.	.90	1.00
Ramapo Green*	lb.	——	3.50
Rubber Dispersed Greens	lb.	1.23	3.08
Rubber Green FD* (Disp.)	lb.	——	2.05
Rubber Green X-1292*	lb.	——	1.55
Stan-Tone MBS*	lb.	1.55	3.35
GPE*	lb.	3.00	4.50
PC*	lb.	1.70	3.80
Vansul Green M.B.*	lb.	1.05	2.90

Maroon

Maroon Powders	lb.	.79	3.60
Vansul Maroon M.B.*	lb.	——	3.35

Orange

Mercadium X-2667*	lb.	——	1.78
Molybdate Orange	lb.	——	.46½
Oswego Orange X2065*	lb.	——	3.00
Rubber Orange OD* (Disp.)	lb.	——	2.25
Stan-Tone Cadmium Dry*	lb.	2.02	4.45
Cadmium Paste*	lb.	2.47	3.20
GPE*	lb.	1.20	4.35
PC*	lb.	.75	2.75
Vansul Orange M.B.*	lb.	2.40	2.45

Red

Antimony Trisulfide	lb.	.72	.78
R.M.P. Sulfur Free*	lb.	——	.78
R.M.P. No. 3*	lb.	——	.72
Cadmolith Red* (bbls.)	lb.	1.79	2.45
Cooke M.B. Red*	lb.	1.00	3.15
Graphic Red (dlvd.)	lb.	——	.79
Indian Red, American, Pure*	lb.	.13¾	.14
Doxco (English)*	lb.	.11½	.11¾
Kroma Reds*	lb.	.14	.15
Mapico Reds* (50 lb. bags)	lb.	.13¾	.14
Mercadium X-2668 Light*	lb.	——	1.95
X-2669 Medium Light*	lb.	——	2.10
X-2670 Medium*	lb.	——	2.25
X-2671 Dark*	lb.	——	2.40
Oximony Red Iron Oxide	lb.	.12¾	.13
Recco Red Oxide*	lb.	.12	.13
Red Iron Oxide, Light	lb.	.13¾	.14
Red Powders	lb.	——	4.40
Rubber Dispersed Reds	lb.	1.47	3.58
Rubber Red PBD* (Disp.)	lb.	——	1.75
2BD, Dispersed*	lb.	——	1.80
2BL*	lb.	——	1.24
PBL*	lb.	——	1.65
Rubanox Red CP-762* (dlvd.)	lb.	——	1.40
Rubber Red CP-339* (dlvd.)	lb.	——	1.10
Rubber Red X-1148*	lb.	——	.88
Solfast Red*	lb.	1.50	1.95
Stan-Tone MBS*	lb.	1.20	3.53
GPE*	lb.	1.65	2.00
PC*	lb.	1.30	2.50
PDS*	lb.	1.40	1.55
PVC*	lb.	1.65	1.90
Sun Burnt Red*	lb.	.11½	.11¾
Vansul Red M.B.*	lb.	1.00	3.35
Watchung Red*	lb.	1.65	1.95

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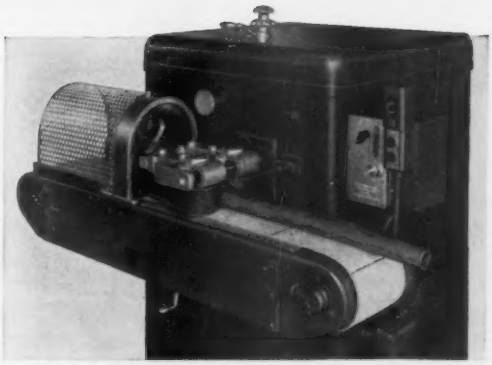

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COLORING AGENTS (Cont'd)

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.20¾	.21
20* (50 lb. bags)	lb.	.20¼	.20½

White—Lithopone

Albalith*	lb.	.0800	.0975
Eagle-Picher*	lb.	.0800	.0975
Permolith*	lb.	.0800	.0975
Sunolith*	lb.	.0800	.0975

White—Titanium Pigments

Stan-Tone PC*	lb.	——	.55
Ti-Cal*	lb.	.09	.09¾
R-25*, R-22*, R-27*, R-30*	lb.	.09	.09½
R-60*	lb.	.09¼	.09¾
Ti-Pure*	lb.	.24½	.27½
Anatase Grades*	lb.	.24½	.25½
Rutile Grades*	lb.	.26½	.27½
Titanox A*—all grades (dlvd.)	lb.	.24½	.25½
C-50* (dlvd.)	lb.	.13⅞	.14⅞
RA* (dlvd.)	lb.	.26½	.27½
RA-10* (dlvd.)	lb.	.26½	.27½
RA-NC* (dlvd.)	lb.	.26½	.27½
RC* (dlvd.)	lb.	.09¼	.09¾
RC-HT* (dlvd.)	lb.	.09	.09½
Unitane O-110*	lb.	——	.245
O-220*	lb.	——	.245
O-310*	lb.	——	.245
O-410*	lb.	——	.245
OR-150*	lb.	——	.265
OR-250*	lb.	——	.265
OR-340*	lb.	——	.265
OR-342*	lb.	——	.265
OR-350*	lb.	——	.265
OR-540*	lb.	——	.265
OR-640*	lb.	——	.265
Zopaque*	lb.	.22½	.23½
R*	lb.	.24½	.25½

White—Zinc Oxide (American Process)

AZO-ZZZ 11* (22*, 33*, 44*, 55*)	lb.	.1450	.1550
Eagle-Picher AAA*	lb.	.1450	.1550
Horse Head Special*	lb.	.1450	.1550
XX*	lb.	.1450	.1550
Protox 166*	lb.	.1450	.1550
167*	lb.	.1450	.1550
267* (pelleted)	lb.	.1450	.1550
St. Joes Black Label*	lb.	.1450	.1550
Green Label*	lb.	.1450	.1550
Red Label*	lb.	.1450	.1550

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450	.1550
Florence Green Seal*	lb.	.1625	.1725
Red Seal*	lb.	.1575	.1675
White Seal*	lb.	.1675	.1775
Kadox 25*	lb.	.1675	.1775
15*, 17*, 72* & 515	lb.	.1450	.1550
Protox 168*	lb.	.1450	.1550
169*	lb.	.1450	.1550
268* (pelleted)	lb.	.1450	.1550
U.S.P. (cartons)	lb.	.1775	.1875
XX-78* (l.c.l.)	lb.	——	.15½

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530	.2630

Yellow

Benzidine Yellow	lb.	2.10	2.35
Cadmolith Yellow* (bbls.)	lb.	——	1.15
Chrome Yellow	lb.	——	.33½
Cooke M.B. Yellow 405*	lb.	1.90	2.00
Iron Oxide, Pure			
Light Shades	lb.	.12	.12¼
Dark Shades	lb.	.11½	.11¾
Mapico Yellow* (50 lb. bags)	lb.	.12	.12¼
Rubber Dispersed Yellows	lb.	1.27	2.13
Rubber Yellow GD* (disp.)	lb.	——	2.15
GL*	lb.	——	2.05
Rubber Yellow X-1940*	lb.	——	2.35
Stan-Tone Cadmium Dry*	lb.	2.80	3.03
Cadmium Paste*	lb.	1.63	1.99
MBS*	lb.	1.30	2.20
GPE*	lb.	4.25	4.50
PC*	lb.	.55	3.40
Sumatra Yellow X-1940*	lb.	——	2.35
Toluidine Yellow	lb.	2.00	2.10
YL-660 D*	lb.	1.20	1.25
Oximony Iron Oxide	lb.	.12¾	.13
Vansul Yellow M.B.*	lb.	1.00	2.00
Yellow Powders	lb.	2.00	5.00
Zinc Yellow	lb.	——	.27½

DISPERSING AGENTS

Anchoid*(†)	lb.	.24	.25
Anhydrapent*	lb.	.56	.59
Armeen 18*	lb.	.38	.40
Blancol*	lb.	——	.15¾
Darvan No. 1* (and No. 2*)	lb.	.22	.30
Daxad 11* (21*, 23*)	lb.	.08	.30
Diethanolamine (dms., dlvd.)	lb.	.24½	.27½
Dispersaid*	lb.	1.25	1.35
Emcol K-8300* (dms.)	lb.	.19	.20
Emulphor ON-870*	lb.	——	.55
Furala*	lb.	.06½	.07½
Halloid*	lb.	.04½	.05½
Hycryl A-1000*	lb.	——	.148
Igepal CO-630*	lb.	——	.29
Igepon T-73*	lb.	——	.29½
Kyro EO* (dms.)	lb.	——	.29¾
Leonil SA*	lb.	——	.55
Lomar PW*	lb.	——	.18
Marasperse C*	lb.	.06¼	.06¾
CB*	lb.	.12¼	.13¼
N*	lb.	.09½	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25	.28
Naccotan A*	lb.	.16½	.21
Nekal BA-75*	lb.	——	.40
BX-78*	lb.	——	.64
Nopco 1187-X*	lb.	.15	.16
Pluronic F68*	lb.	.38½	.44
Polyfon*	lb.	.08	.09
R & R 551*	lb.	——	.28
Rubbex*	lb.	.267	.285
Stablex B*	lb.	.50	.95
Stan-Chem BQC*	lb.	.12¼	.17¼
1067*	lb.	——	.13½
1471*	lb.	.1687	.2187
2251*	lb.	.12¼	.17¼
Trenamine D-25*	lb.	.32½	.36
Triethanolamine (dms., dlvd.)	lb.	.22	.25
U-3051*	lb.	——	.148
Yelkin TT*	lb.	.13	.16
TTS*	lb.	.13	.16

EXTENDERS

Advagum 1098*	lb.	——	.64
Arceo 1071-13B*	lb.	.14½	.15½
1073-18B*	lb.	.13½	.14½
1294-36B*	lb.	.11½	.12½
Car-Bel-Ex-A* (and B*)	lb.	——	.14
Extender 600*	lb.	——	.1765
Facile Gum 4A*	lb.	.48	.50
Millex*	lb.	——	.07
W*	lb.	——	.07
Nopco 2271*	lb.	.15½	.16½
Polyco 418*	lb.	.17	.18
PR-162 Latex Extender*	lb.	——	.182
Solvitose HDF*	lb.	.22	.25
Synprolac*	lb.	.16	.23
Synprowax*	lb.	——	.23
Vistanex*	lb.	——	.35

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.20	1.33
Lionite*	lb.	.14½	1.25
Pumice	lb.	.03	.05
Walnut Shell Grits	lb.	.05	.08
Aluminum Hydrate	lb.	.0850	.1200
Kaiser Alumina*	lb.	.026	.059
Aluminum Silicate			
Aluminum Flake*	ton	23.50	30.00
Marter White*	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	95.50	100.00
Barytes			
No. 1 Floated, White*	ton	45.00	65.10
No. 2 Floated, Un-bleached*	ton	43.00	63.10
No. 22 Barytes* (c.l.)	ton	——	25.00
No. 3805 Barytes*	ton	22.00	26.75
Foam A*	ton	——	45.00
Sparmite*	ton	80.00	85.00
XIOR*	ton	75.00	80.00
Bentonite (c.l.)	ton	——	13.50
Argosite Clay* (c.l.)	ton	——	12.50
Bennett Clay* (c.l.)	ton	——	32.50
SPV Volclay* (c.l.)	ton	——	12.50
White Hi-Gel*	ton	——	65.90
Blanc Fixe	ton	72.50	120.00
Calcium Carbonate			
Atomite* (c.l.)	ton	——	32.50
B.I. White No. 1 (c.l.)	ton	——	9.00
Calcene NC*	ton	72.50	92.50
TM*	ton	75.00	95.00
Calwhite*	ton	——	20.00
Camel-Carb*	ton	——	12.00
Camel-Tex*	ton	——	20.00
Camel-Wite*	ton	——	32.50
Duramite*	ton	——	36.00
Gamaco* (c.l.)	ton	——	32.50
Georgia Marble 5-25* (c.l.)	ton	——	20.00
No. 10 White* (c.l.)	ton	——	11.00
Kalite*	ton	50.00	65.00
Keystone White*	ton	——	18.00
Laminar*	ton	——	30.00
Lesamite* (c.l.)	ton	——	27.50
Lorite*	ton	30.00	35.00
Millical*	ton	38.00	53.00
Multifex MM*	ton	110.00	125.00
Non-Fer-Al*	ton	32.50	37.50
Purecal M*	ton	56.75	80.75
SC*	ton	110.00	125.00
T*	ton	110.00	125.00
U*	ton	120.00	135.00
Rambo No. 1*	ton	——	10.50

FILLERS (Cont'd)

Calcium Carbonate (cont'd)			
Snowflake*	ton	17.00	20.00
Super Multifex*	ton	160.00	175.00
Surfex*	ton	37.50	52.50
Suspenso*	ton	35.50	50.50
Witcarb Reg.*	ton	56.75	85.00
P*	ton	110.00	140.00
R*	ton	120.00	150.00
RC*	ton	110.00	140.00
York White*	ton	——	9.50
Calcium Silicate			
Silene EF*	ton	120.00	140.00
Calcium Sulfate, Anhydrous			
Snow White Filler*	ton	——	20.50
Calcium Sulfate Hydrous			
Terra Alba No. 1*	ton	——	16.00
Chalk Whiting (l.c.l.)	lb.	.01½	.01¾
Recco Paris Whiting*	ton	——	33.00
OMYA Whiting*	ton	——	30.00
Clay			
Afton Clay*	ton	11.00	30.00
Aiken Clay*	ton	——	14.00
Alsilite* (c.l.)	ton	30.00	45.00
Alsite* (c.l.)	ton	——	14.00
Aluminum Flake*	ton	23.50	30.00
Buca* (c.l.)	ton	——	45.00
Burgess No. 20*	ton	——	35.00
No. 30*	ton	——	37.00
Burges Iceberg*	ton	——	50.00
Catalpo* (c.l.)	ton	——	35.00
Champion*	ton	——	14.00
C.S.D.* (c.l.)	ton	——	13.50
Crown*	ton	——	14.00
Dixie* (c.l.)	ton	——	14.00
Franklin Clay—R* (c.l.)	ton	13.50	30.00
G. K. Soft*	ton	11.00	28.00
Harwick Clays*	ton	14.50	57.00
Hi-White R*	ton	——	13.50
Kalloid Clay* (c.l.)	ton	——	10.50
LGB*	ton	——	17.00
LGP*	ton	——	19.00
McNamee* (c.l.)	ton	——	13.50
Natka 1200 (c.l.)	ton	——	12.00
Par* (c.l.)	ton	——	11.00
Paragon*	ton	——	13.50
Pigment 5*	ton	23.50	26.50
33*	ton	——	37.00
Recco* (c.l.)	ton	——	14.00
Swanee Clay*	ton	——	12.50
Snobrite*	ton	——	12.50
Suprex*	ton	——	14.00
Whitetex* (c.l.)	ton	——	50.00
Windsor Clay* (c.l.)	ton	13.00	30.00
Diatomaceous Earth	ton	30.00	50.00
Kaylorite* (c.l.)	ton	——	30.00
Lorite*	ton	——	30.00
Flock			
Cotton (White)	lb.	.28	.32
Colored	lb.	.11	.19
Filfloc F 40-9000*	lb.	——	.13
F 6000*	lb.	——	.36
Polycel*	ton	110.00	210.00
Rayon, Bleached or Dyed	lb.	.75	1.20
Rayon, Grey	lb.	——	.18
Rayon, Pink	lb.	——	.20
Solka-Floc* (l.c.l.)	lb.	.07	.16
Glue, Amber	lb.	.16	.18
Ground Softwood Bark			
Silvacon* (c.l.)	ton	55.00	100.00
Leather			
Flour (dust)	lb.	.12	.15
Shredded	lb.	.05	.17
Lignin	lb.	.06	.08
Indulin*	lb.	.06	.08
Limestone, Pulverized	ton	3.00	5.00
Asbestol Regular*	ton	27.00	29.00
Asbestol Superfine*	ton	32.00	34.00
Georgia Marble No. 10*	ton	——	11.00
Industrial Filler No. 100*	ton	——	5.75
Micro Velva A*	ton	49.00	51.00
L*	ton	57.00	59.00
No. 1 White*	ton	——	10.00
Magnesium Carbonate	lb.	.10½	.14¼
K & M Clearcarb*	lb.	——	.14
Technical* (c.l., eqld.)	lb.	.10½	.12
Magnesium Oxide			
Magnesite*	lb.	.057	.073
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼	.07¾
Concord*	lb.	.07½	.08¼
Micro-Mica*	lb.	.07½	.08¼
Mineralite* (c.l.)	ton	40.00	85.00
Silversheen*	lb.	.08	.08¾
Triple A Mica* (c.l.)	ton	——	25.00
Vermiculite*	lb.	——	.11
Wet Ground Biotite Mica	lb.	.06	.06¾
Wet Ground Mica No. 160*	lb.	.07½	.08¼
Pecan Shell Flour			
Stan Shell*	ton	45.00	75.00
Pyrophyllite			
No. 261*	ton	——	11.50
Pyrax A* (c.l.)	ton	——	13.50
WA* (c.l.)	ton	——	16.00
Sawdust, Graded	ton	14.00	35.00
Silica	ton	16.00	27.00
DC Silica (pelleted)	lb.	1.45	1.65
Extra Fine (bags) (c.l.)	ton	——	43.00
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Lo-Micron Slate Flour*	lb.	——	.04½
No. 133 Slate Flour*	ton	——	4.55
Sodium Silico Aluminate			
Zeolex 23*	ton	120.00	140.00

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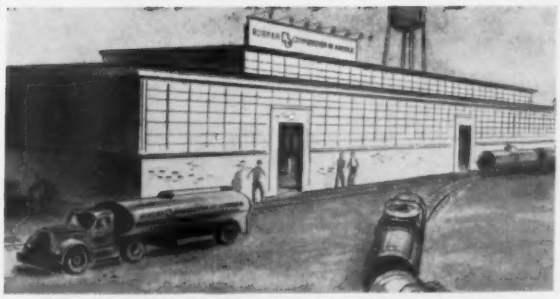

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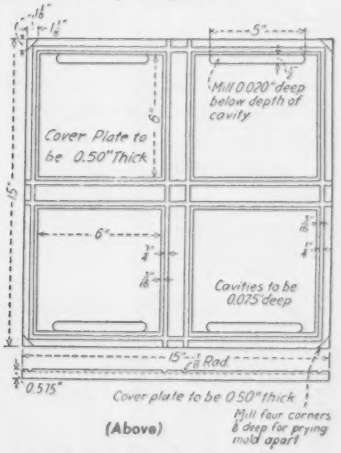
For Rubber Testing & Production

Shown here are but a few of the many types of rubber working equipment available. Please submit your problem.


Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
Cavities to be 0.075 deep
Cover plate to be 0.50" thick
Mill four corners ⅛ deep for prying mold apart

(Above)

Standard ASTM and Federal dies for cutting test tensile and tear strength samples, and dies for slab curing carried in stock. Write for catalog.

Pacific Coast: H. M. Royal, Inc., Los Angeles

HOGGSON & PETTIS MANUFACTURING CO. • 141A Brewery St. • NEW HAVEN 7, CONN.

FILLERS (Cont'd)

Talc (Magnesium Silicate)			
Asbestol Regular*	ton	——	- 25.00
Eastern RC-500*	ton	——	- 30.00
No. 41*	ton	——	- 17.70
No. 549*	ton	——	- 63.00
French*	ton	——	- 59.00
L.S. Silver*	ton	32.75	- 37.75
No. 367*	ton	——	- 13.00
No. 1600*	ton	——	- 70.60
No. 1768*	ton	——	- 13.00
Nytal 200* (c.l.)	ton	——	- 27.00
300* (c.l.)	ton	——	- 37.00
Sierra White*	ton	19.75	- 30.75
Soapstone*	ton	——	- 13.00
Walnut Shell Flour	ton	55.00	-100.00
Stan-Shell*	ton	40.00	- 80.00
Whiting, Commercial	ton	——	- 7.50
Allied Whiting*	ton	10.50	- 21.50
Camel-Carb*	ton	——	- 10.00
Calwhite (c.l.)	ton	——	- 20.00
C-C-O White*	ton	——	- 19.00
Georgia Marble No. 15*	ton	——	- 20.00
No. 16*	ton	——	- 20.00
Keystone* (c.l.)	ton	18.00	- 20.00
Piqua No. 1 YAA* (c.l.)	ton	——	- 9.00
No. 2 LS* (c.l.)	ton	——	- 9.00
Snowflake* (c.l.)	ton	——	- 20.00
Stan-White 325*	ton	10.50	- 13.10
Veroc* (c.l.)	ton	——	- 10.50
Welco* (c.l.)	ton	——	- 10.50
York White R* (c.l.)	ton	——	- 9.00
Wood Flour	ton	31.50	- 48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	- 2.35
Black Out*	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.50	- .60
VanWax*	gal.	1.45	- 1.50

FLAME RETARDANTS

Cellufiex CEF* (dms.)	lb.	——	- .65
Chlorowax 50*	lb.	.16¾	- .17¾
70*	lb.	.18½	- .20
Halowax*	lb.	.35½	- .61½
Zinc Borate 3167*	lb.	.1920	- .2020
Zyrox Compounds*	lb.	.38½	- .95½

LATEX MODIFIERS

Ludox	lb.	.15	- .16¾
OPD-101*	lb.	——	- .26
202*	lb.	——	- .29
Ubatol U-2001* (dms.)	gal.	1.58	- 1.67

LUBRICANTS, MOLD

Akro Gel*	lb.	——	- .165
Alipal CO-433*	lb.	——	- .20
CO-436*	lb.	——	- .24
Aluminum Stearate Crown Brand*	lb.	.37	- .42
Aquadag*	lb.	3.50	- 4.00
Aquarex D*	lb.	——	- .78
L*	lb.	——	- .94
ME*	lb.	——	- .80
MDL*	lb.	——	- .33
WAQ*	lb.	——	- .22
Armid O*	lb.	.39	- .41
Borax, Granular (l.c.l.)	ton	89.00	- 94.00
Carbowax 4000*	lb.	.31	- .32
CD Mold Release A*	gal.	——	- 6.50
B*	gal.	——	- 5.00
Colite Concentrate* (dms.)	gal.	.90	- 1.15
Colite D43D*	gal.	1.15	- 1.40
Concentrex*	lb.	——	- .25
Dag Dispersions No. 197*	lb.	1.85	- 2.90
D.C. 7 Compound*	lb.	5.13	- 6.50
D.C. Emulsion No. 7*	lb.	1.59	- 2.07
No. 8*	lb.	1.26	- 1.80
No. 35*	lb.	1.26	- 2.50
No. 35A*	lb.	1.26	- 2.50
No. 35B*	lb.	1.26	- 2.50
No. 36*	lb.	1.26	- 2.50
D.C. Mold Release Fluid*	lb.	3.14	- 4.75
Dri-Lube*	lb.	——	- .22
Emulsion Lubricant A80*	lb.	——	- 1.80
45*	lb.	——	- 1.80
G-E Silicone Fluid SF-92*	lb.	3.39	- 5.00
SF-96*	lb.	3.14	- 4.25
G-E Silicone Emulsion SM-55*	lb.	1.26	- 1.80
SM-61*	lb.	1.36	- 1.55
SM-62*	lb.	1.26	- 1.80
Glydag G*	lb.	1.30	- 2.45
Hawkeye Flake* (dlvd.)	lb.	.15	- .15¾
HSC No. 35*	lb.	1.28	- 1.34
No. 515	lb.	1.28	- 1.34
Igepal CO-430*	lb.	——	- .29
CO-530*	lb.	——	- .29
CO-630*	lb.	——	- .29
Igepon AP-78*	lb.	——	- .48
T-51*	lb.	——	- .13½
Kokobace R*	lb.	.17½	- .18½
Lubrex	lb.	.25	- .30

LUBRICANTS, MOLD (Cont'd)

Lubri-Flo*	gal.	10.00	- 12.00
Migralube*	lb.	——	- .35
ML-1027-2C*	gal.	——	- 2.15
ML-1028-2C*	gal.	——	- 2.15
Mold Lubricant No. 72 Conc.* (dms.)	gal.	——	- 1.90
No. 735* (dms.)	gal.	——	- 1.25
No. 769* (dms.)	gal.	——	- 1.20
No. 825* (dms.)	gal.	——	- 1.90
No. 856* (dms.)	gal.	——	- 1.90
No. 880* (dms.)	gal.	——	- 1.12
No. 887* (dms.)	gal.	——	- 1.75
No. 896* (dms.)	gal.	——	- 1.26
No. 935* (dms.)	gal.	——	- 1.60
No. 956* (dms.)	gal.	——	- 2.50
No. 965* (dms.)	gal.	——	- 2.05
No. 967* (dms.)	gal.	——	- 2.40
No. 969* (dms.)	gal.	——	- 1.55
No. 975* (dms.)	gal.	——	- 2.90
No. 980* (dms.)	gal.	——	- 1.55
No. 987* (dms.)	gal.	——	- 2.90
Moldeze No. 3*	gal.	5.00	- 6.00
Mold-Brite*	gal.	——	- 1.50
Monopole Oil MD*	lb.	——	- .16
Olate Flakes*	lb.	.22¾	- .23¾
Orvus WA Paste* (dms.)	lb.	——	- .22
Plaskon Polyethylene S*	lb.	.32	- .47
Polyglycol 15-200*	lb.	.25	- .28¾
E4000*	lb.	.31	- .37
Prodag*	lb.	.28	- .42
Purity Flake* (dlvd.)	lb.	.18	- .19¾
Rubber-Flo*	gal.	1.25	- 2.00
Rubber-Glo*	gal.	——	- .94
Rusco Mold Paste*	lb.	——	- .25
Sericite* (l.c.l.)	ton	65.00	- 75.00
Silicone Oil A145*	lb.	3.18	- 3.61
A65*	lb.	2.50	- 2.75
Soybean Lecithin	lb.	.13	- .17
Thermalube*	lb.	——	- .13¾
UC Silicone L-45*	lb.	3.14	- 4.75
LE-45*	lb.	1.26	- 2.50
Ucon Lubricants*	lb.	.26¾	- .27¾
Ulco Mold Soap*	lb.	.15	- .29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	——	- .25
Emcol DS-50*	lb.	——	- .38
RDH-S*	lb.	——	- .27
Extrud-o-Lube*	gal.	——	- 1.54
G.B. Naphthenic Neutrals*	gal.	.11	- .18
Ivory Chips*	lb.	.18¾	- .19¾
Latex-Lube GR* (dlvd.)	lb.	.19¼	- .20
No. 82-A* (450 lb. dms.)	lb.	——	- .08½
Propylene Stearate (dms.)	lb.	.35	- .60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.39	- .44
Calcium Stearate	lb.	.37	- .42
Crown Brand*	lb.	.37	- .42
D.C. 4 Compound*	lb.	5.13	- 6.50
D.C. 200 Fluid*	lb.	3.14	- 4.75
ELA*	lb.	——	- .82
G-E Silicone Fluid SF-92*	lb.	3.39	- 5.00
Glycerized Lubricant*	gal.	——	- 1.48
Glydag B*	lb.	1.50	- 2.10
G*	lb.	1.30	- 2.45
HSC No. 35*	lb.	1.28	- 1.34
No. 515*	lb.	1.28	- 1.34
Hydro-Zinc*	lb.	——	- .20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¾	- .18¼
R-66*	lb.	——	- .16½
Liqui-Lube* (dlvd.)	lb.	——	- .16¼
N.F.* (dlvd.)	lb.	——	- .16¾
N.T.* (dlvd.)	lb.	——	- .16¾
Lubrex*	lb.	.25	- .30
Magnesium Stearate Crown Brand*	lb.	.40	- .45
Polyethylene Glycol	lb.	.22	- .26
Rubber Free (Concentrate)*	gal.	——	- 1.44
Jel*	lb.	.18	- .21½
Slab-Dip*	lb.	.16	- .18½
Soybean Lecithin	lb.	.13	- .17
Stock-Lube*	lb.	——	- .19
UC Silicone L-45*	lb.	3.14	- 4.75
Zinc Stearate	lb.	.39	- .44

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	- 1.65
Alkon* (dlvd.)	lb.	.16	- .16½
CA-301*	gal.	——	- 2.29
CA-302*	gal.	——	- 2.63
G-O 6910*	lb.	.38	- .40
Metso Anhydrous*	cwt.	5.35	- 7.60
Metso 99*	cwt.	4.80	- 7.05
200*	cwt.	6.30	- 8.55
Granular*	cwt.	4.10	- 6.35
Orvus Extra Granules*	lb.	.22½	- .23½
Rubber-Sol*	gal.	2.97	- 3.97
Sprex A.C.* (dlvd.)	lb.	.17¾	- .18¾
Zip Mold Cleaner*	gal.	.95	- 1.45

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	- 1.25
Pepton 22 Plasticizer*	lb.	.79	- .82
RPA 2*	lb.	——	- .78
3*	lb.	——	- .47
3 Conc.*	lb.	——	- .83
5*	lb.	——	- .59
6*	lb.	——	- 1.58

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	——	- .09
Adipol BCA*	lb.	.47	- .47½
2EH*	lb.	.42½	- .45½
10A*	lb.	.42½	- .45½
ODY*	lb.	.47	- .50
810*	lb.	.42½	- .45½
XX*	lb.	.42½	- .45½
Anhydrol 6990*	lb.	.51	- .56
Arneel*	lb.	.27	- .39
Arolene 1980* (c.l.)	lb.	——	- .10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.05	- .06½
Aromatic Tar	gal.	.0573	- .1973
Bardol*	lb.	.02¾	- .03¾
B*	lb.	.06¼	- .06½
Bayol D*	gal.	——	- .382
F*	gal.	——	- .52
Beeswax, Bleached	lb.	.80	- .83
Yellow Refined	lb.	.75	- .80
Bondogen*	lb.	.55	- .60
B.R.C. No. 20*	lb.	.0150	- .0175
No. 21*	lb.	.02¾	- .03
No. 22*	lb.	.02½	- .02¾
B.R.H. 2*	lb.	.0213	- .0351
BRS 700*	lb.	.0200	- .0285
B.K.T. 3*	lb.	.0180	- .0265
4*	lb.	.0250	- .0260
7*	lb.	.0300	- .0310
B.K.V.*	lb.	.0475	- .0565
Bunarex Resins*	lb.	.07	- .08
Bunatak AH*	lb.	——	- .09½
N*	lb.	——	- .31
U*	lb.	——	- .17½
No. 90*	lb.	——	- .09
No. 210*	lb.	——	- .14
Butac*	lb.	.12½	- .13½
BxDC (dms.)	lb.	.40	- .41
Butyl Carbitol Perlargonate (dms.)	lb.	——	- .64½
Butyl Cellosolve Perlargonate (dms.)	lb.	——	- .68
Butyl Oleate	lb.	.23¾	- .26
Butyl Palmitate	lb.	——	- .26½
Butyl Stearate (dms.)	lb.	.22¾	- .24¼
BWH-1*	lb.	.16	- .17
Cabflex DDA*	lb.	.42½	- .45½
DDP*	lb.	.30½	- .33½
Di-BA*	lb.	.43¼	- .46¼
Di-OA*	lb.	.42½	- .45½
Di-OP*	lb.	.30½	- .33½
Di-OZ*	lb.	.48	- .51
DOA*	lb.	.42½	- .45½
DOP*	lb.	.30½	- .33½
HS-10	lb.	.44	- .47
ODA*	lb.	.42½	- .45½
ODP*	lb.	.30½	- .33½
TCP*	lb.	.34½	- .37½
Califlux 510* (and 550*)	lb.	.02½	- .03¼
G.P.*	lb.	.01¼	- .02
R-100*	lb.	.04½	- .05¼
TT*	lb.	.0170	- .0245
Candelilla Wax, Prime	lb.	.52	- .54
Refined Light	lb.	.55	- .58
Carbowax 4000* (dms.)	lb.	.31	- .32
Carnauba Wax, Crude	lb.	.60	- .62
Flaked	lb.	.75	- 1.20
Refined, Technical	lb.	.65	- .68
Refined, Pure	lb.	.75	- .80
Yellow	lb.	1.10	- 1.15
Cellufiex* (dms.) 112* (t.c., dlvd.)	lb.	——	- .34½
179-A* (t.c., dlvd.)	lb.	——	- .34½
179-C* (t.c., dlvd.)	lb.	——	- .34½
179-EG* (t.c., dlvd.)	lb.	——	- .34½
DBP* (t.c., dlvd.)	lb.	——	- .30
DOP* (t.c., dlvd.)	lb.	——	- .30½
TPP* (dms., eqld.)	lb.	——	- .40
Ceresin Wax	lb.	.11½	- .28
Chlorowax 40*	lb.	.15¼	- .17¼
50*	lb.	.16¾	- .17¾
70*	lb.	.18½	- .20
LV*	lb.	.17¼	- .19¼
Chlorowax 40*	lb.	.14½	- .15½
CTLA Polymer*	gal.	.20	- .36
Cumar Resins*	lb.	.07	- .19
Darex DBP*	lb.	.33	- .35¾
DOP*	lb.	.34	- .37
DIOP*	lb.	.34	- .37
D.B.M.*	lb.	.32	- .34¾
Decylbutyl Phthalate	lb.	.27	- .30
Degras, Common	lb.	——	- .14
Diallyl Phthalate	lb.	.49¾	- .52¼
Dibenzyl Sebacate	lb.	.88	- .89½
Dibutoxyethyl Sebacate	lb.	——	- .56¾
Dibutyl Phthalate	lb.	.30	- .33
Dibutyl Sebacate	lb.	.64½	- .67
Dicapryl Adipate	lb.	.42	- .44
Dicapryl Phthalate	lb.	.29½	- .31½
Dicapryl Sebacate	lb.	.58	- .59½
Di-Carbitol Phthalate (dms.)	lb.	.42	- .42½
Dicyclohexyl Phthalate	lb.	.58¼	- .59¼
Diethyl Phthalate (t.c.)	lb.	.25	- .27¾
Di-2-ethylhexyl Phthalate	lb.	——	- .30½
Dihexyl Adipate	lb.	.42	- .44
Dihexyl Phthalate	lb.	.30	- .32

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reliable delivery
good workmanship

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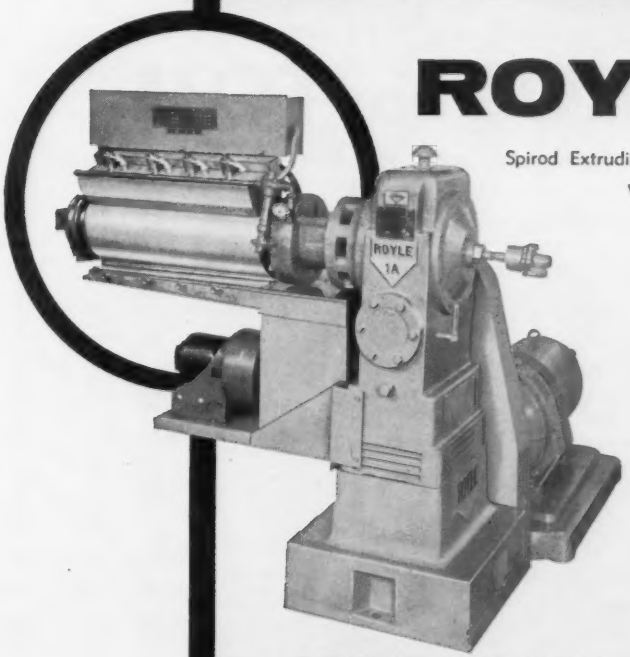

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PATERSON 3, NEW JERSEY

PLASTICIZERS & SOFTENERS (Cont'd)

Dihexyl Sebacate	lb.	.62	.63½
Diisobutyl Azelate	lb.	——	.47¾
Di-iso-octyl Adipate	lb.	.42½	.45½
Di-iso-octyl Phthalate (t.c.)	lb.	.30½	.33½
Dimethyl Phthalate (t.c.)	lb.	.27½	.30¼
Dimethyl Sebacate	lb.	1.25	1.26½
Dinonyl Adipate	lb.	.44½	.47½
Dinopol 235*	lb.	.35½	.38½
IDO*	lb.	.30½	.33½
MOP*	lb.	.32½	.35½
Dioctyl Adipate	lb.	.42½	.45½
Dioctyl Phthalate (dms.)	lb.	.30½	.33½
Dioctyl Sebacate (dms.)	lb.	.58½	.61
D.I.O.P. (dms.)	lb.	.30½	.33½
Dipolymer Oil	gal.	.33	.48
Dispersing Oil No. 10*	lb.	.06	.06¼
Dutrex 6*	gal.	——	.11
15E*	gal.	——	.10
Elastex 10-P*	lb.	.30½	.33½
50-B*	lb.	.25	.28
DCHP*	lb.	.59	.60
Emulphor EL-719*	lb.	——	.58
Epoxy Plasticizer	lb.	.33½	.36
Drapex 4.4*	lb.	.37	.42
Esparto Wax	lb.	——	.55
Estac*	lb.	——	.16
Facile Gum 4A*	lb.	.48	.50
Flexol B-400*	lb.	.27	.28
DOP*	lb.	.32½	.33½
TOF*	lb.	.45½	.46½
3GH*	lb.	.45½	.46
3GO*	lb.	.54½	.55
4GO*	lb.	.34½	.35½
426*	lb.	.29	.30
Flexricin P-1*	lb.	——	.32
P-4*	lb.	——	.31
P-6*	lb.	——	.37
P-8*	lb.	——	.33
Fortex* (dms.)	lb.	.12½	.14½
Galex W-100*	lb.	.15½	.19¼
G.B. Asphaltic Flux*	gal.	.10	.18
G.B. Light Process Oil*	lb.	.02½	.03¼
Medium Process Oil*	lb.	.03½	.04¼
G.B. Naphthenic Neutrals*	gal.	.11	.18
Good-rite GP233*	lb.	.44¾	.47¾
GP235*	lb.	.42½	.45½
GP236*	lb.	.42½	.45½
GP261*	lb.	.34	.37
GP265*	lb.	.30½	.33½
GP266*	lb.	.30½	.33½
Harflex 500* (dms.)	lb.	.31½	.33½
Herron-H.T.*	gal.	.16	.27
Herron-Plas*	lb.	——	.03¾
Herron-Wax*	lb.	.05¼	.06
No. 23*	lb.	.08¼	.08¾
No. 24*	lb.	.07¼	.07¾
HSC No. 13*	lb.	.20	.27
No. 28 and 38*	lb.	.20	.27
Indonex 632½* (633½*, 634½*, 637½*)	gal.	.11	.17
Isooctyl Decyl Phthalate	lb.	.30½	.33½
Kapsol*	lb.	.32¼	.35¼
Kenflex*	lb.	.18	.27
Kesscoflex 101* (dms.)	lb.	——	.39
102* (dms.)	lb.	——	.32½
103* (dms.)	lb.	——	.41½
104* (dms.)	lb.	——	.48
105* (dms.)	lb.	——	.33¼
106* (dms.)	lb.	——	.35½
108* (dms.)	lb.	——	.37
109* (dms.)	lb.	——	.36¼
KP 23*	lb.	.29	.32
90*	lb.	.40	.43
140*	lb.	.46	.48½
201*	lb.	.58¼	.59¼
220*	lb.	.31	.34
555*	lb.	.45	.47½
Kremol 40*	gal.	.36	.46
50*	gal.	.39	.49
Kronisol* (dms.)	lb.	.33	.36
Kronitex AA* (dms.)	lb.	.34½	.37½
I* (dms.)	lb.	.34½	.37½
K-3*	lb.	.34½	.37½
MX*	lb.	.34½	.37½
Lanolin, Tech. Anhydrous	lb.	——	.26
Latex-Lube G.R.*	lb.	.19¼	.20
Lead Oleate	lb.	——	.30½
Lindol* (dms., t.c.)	lb.	.34½	.37½
Locusol No. 1-6980*	lb.	.30	.34
2-Mercaptoethanol (dms.)	lb.	1.25	1.50
Methox*	lb.	.38½	.41
Methyl Laurate	lb.	.25	.27
Methyl Oleate	lb.	——	.20
Methyl Stearate (dms.)	lb.	——	.30
Monoplex S-71*	lb.	.46½	.47½
Montan Wax, Crude	lb.	.21	.27
Flaked	lb.	.27	.29
Morflex*	lb.	.32	.69½
MR 2088* (dms.)	lb.	——	.19
Natac*	lb.	.12	.13
Nebony Resins* (dms.)	lb.	.04½	.07¼
Neolene 210* (t.c.)	lb.	——	.16
212* (t.c.)	lb.	——	.14
220* (t.c.)	lb.	——	.15
Nerium*	lb.	——	.09
Nevillac Resins* (dms.)	lb.	.31	.85
Neville LX-880* (dms.)	lb.	.12	.13½
LX-685* (dms.)	lb.	.12½	.17½
Neville Resins* (dms.)	lb.	.07¼	.20
Nevindene Resins* (dms.)	lb.	.16½	.20
Nevinol* (dms.)	lb.	——	.24
Nuba 1* (and 2*) (dms.)	lb.	.06¼	.06¾
3X* (dms.)	lb.	.07¾	.08¼
No. 480 Oil Proof Resin*	lb.	——	.18
Ohopex Q10* (dms.)	lb.	.29½	.32½
R9* (dms.)	lb.	.35½	.37¾

PLASTICIZERS & SOFTENERS (Cont'd)

Ortho-Nitrobiphenyl	lb.	.13	.15
Ozokerite Wax, White and Yellow	lb.	.24	.31
Paradene Resins (dms.)	lb.	.07¼	.08
Para Flux* (dms.)	gal.	.19¼	.20¼
2016* (dms.)	gal.	.22	.23
Para Lube* (t.c.l.)	lb.	.046	.048
Paraplex G-60*	lb.	.35	.36
G-62*	lb.	.37½	.38½
Parmo*	lb.	.06	.13½
Pepton 22 Plasticizer*	lb.	.79	.82
PG-16*	lb.	——	.35
Philrich-5* (t.c.)	gal.	——	.11
Picco 10* (and 25*)	lb.	.15	.17
60* (and 75*)	lb.	.15	.17
100*	lb.	.15	.17
Piccocizer 30*	lb.	.05½	.07
Piccolastic A* (B*, C*, D* & E*)	lb.	.28	.29
FT* (FHF* & FX*)	lb.	.1815	.1965
T-135*	lb.	.22¼	.23¼
Piccolyte S Resins*	lb.	.20½	.22¾
Piccopale Resins*	lb.	.12	.13
Piccoumaron Resins*	lb.	.07	.24½
Pigmentar*	lb.	.0460	.0745
Pigmentaroil*	lb.	.0460	.0745
Plastac M*	lb.	——	.09¼
Plasticizer 2286*	lb.	——	.26¼
Plasticizer 4141*	lb.	.56¾	.66¾
Plasticizer DP-200, DP-250, DP-520*	lb.	.42¼	.46¼
Plasticizer MT-511*	lb.	——	.68¾
Plasticizer ODN*	lb.	.34	.40
Plasticizer SC*	lb.	.50	.51
Plasticizer W-13*	lb.	.37	.38¾
Plastoflex 3*	lb.	——	.52
50*	lb.	.34¼	.35¼
55*	lb.	.31	.32
520*	lb.	.37½	.38½
SP-2*	lb.	——	.43
VS*	lb.	.41¾	.42¾
Plastogen*	lb.	.07¾	.08
Plastolein 9050* (c.l.)	lb.	.54	.56
9055*	lb.	.30	.32
9058*	lb.	.50	.52
9250*	lb.	.37¼	.39¼
9715*	lb.	.42½	.45½
Plastone*	lb.	.23	.27
Polycizer 162*	lb.	.30½	.33½
332*	lb.	.39	.41
562 and 662*	lb.	.30½	.33½
532 and 632*	lb.	.42½	.45½
ED*	lb.	——	.51
Polyco 438*	lb.	.34	.35
Polymel C-130*	lb.	.19½	.20½
D*	lb.	.23½	.24½
6*	lb.	.05¾	.07¾
Process Oil C-255* (c.l.)	gal.	——	.22
Propylene Stearate (dms.)	lb.	——	.32
PRR 1*	gal.	.15	.35
PT 67 Light Pine Oil* (dms.)	gal.	——	.60
101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	.0634
400 Pine Tar* (600* & 800*) (t.c., dms.)	gal.	.0460	.0634
PX-104*	lb.	.32	.33
PX-108*	lb.	.32½	.33½
PX-138*	lb.	.32½	.33½
PX-208*	lb.	.44½	.45½
PX-238*	lb.	.44½	.45½
PX-404*	lb.	.66	.67
PX-438*	lb.	.60	.61
PX-800*	lb.	.34	.35
PX-917*	lb.	.36½	.37½
Reogen*	lb.	.13¼	.13½
465 Resin* (dms.)	lb.	.07½	.08
Resin 731-C*	cwt.	——	15.00
Resin C*	lb.	.0225	.0310
Resinex*	lb.	.03¼	.04¾
L-4*	lb.	.02¼	.03¼
Rexflex*	lb.	——	.15
Rosin Oil	gal.	.80	1.35
RR-10 (Neoprene)*	lb.	——	.36
R.S.O. Softening Oil*	lb.	.03	.05
RuBars*	lb.	.19¼	.20
Rubberol*	lb.	——	.25¼
Santicizer B-16*	lb.	.48¾	.49¼
E-15*	lb.	.53¾	.53¼
M-17*	lb.	.44¾	.45¼
No. 140*	lb.	.36½	.37½
No. 141*	lb.	.36	.37
No. 160*	lb.	.28½	.29½
No. 602*	lb.	——	.30½
No. 603*	lb.	——	.27
Sheroiatum*	lb.	.03½	.06
Solarite Resin No. 11*	lb.	.16½	.22½
Staflex DBES*	lb.	.58	.60½
DOS*	lb.	.58	.60½
IXA*	lb.	.32	.35
KA*	lb.	.36	.38¾
Stan Chlor Oils*	lb.	.13½	.20½
70*	lb.	.17½	.30
Stanolind Petrolatum*	lb.	.053	.089
Wax*	lb.	.31	.33
Sunny South Burgundy Pitch*	lb.	.1030	.1085
Pine Tar*	lb.	.0460	.0801
Pine Tar Oil*	lb.	.0460	.0745
Rosin Oil*	gal.	.58	.87½
Superla Wax*	lb.	.34½	.44
Syncera Wax*	lb.	.23	.34
Syn Tac* (c.l.)	gal.	——	.33
Synthetic Revertant Oil	lb.	——	.16
Tar, Refined	gal.	.1200	.1760
Terpene A*	gal.	——	.65
TP-90B*	lb.	.59	.69

PLASTICIZERS & SOFTENERS (Cont'd)

TP-95*	lb.	.65	.75
Transphalt Resins*	lb.	.02¼	.04¾
Tributyl Phosphate	lb.	.50	.53
Tricresyl Phosphate	lb.	.34½	.37½
Turgum S*	lb.	.10¾	.11¾
Vanadiset B*	lb.	.036	.07
C*	lb.	.031	.06
MR 80 Mesh*	lb.	.08½	.12½
Vistac No. 1*	gal.	1.00	1.21
P*	lb.	.18	.18½
Vopcolene 50*	lb.	——	.37
Witcizer 100*	lb.	.26	.27
200*	lb.	.26	.27
201*	lb.	.22¾	.25½
300*	lb.	.30	.33
312*	lb.	.30½	.33½
313*	lb.	.30½	.33½
412*	lb.	.42½	.45½
Witresin*	ton	50.00	57.50

PROCESSING AIDS

Castor Oil, Blown (dms.)	lb.	——	.21
Refined (dms.)	lb.	——	.18½
Castorwax*	lb.	——	.24½
Dutrex 7*	lb.	.12	.20
ELA*	lb.	——	.82
Emcol MAS*	lb.	——	.44
Hydrofol Glycerides 200*	lb.	.15½	.19¼
Kenflex N*	lb.	——	.18
Maleic Anhydride	lb.	——	.27
Millrex*	lb.	——	.15
Nadic Anhydride	lb.	——	.27
Polycin 783*	lb.	——	.24½
Resin No. 510*	lb.	.15	.22
Pulverized*	lb.	.20½	.25
Thiomalic Acid	lb.	——	2.50
Zyrox*	lb.	.50	.79

PROTECTIVE & STABILIZING AGENTS

Acacia*	lb.	.12¾	.21
Alpha Protein	lb.	——	.23
Aroostoocrat*	lb.	——	.07½
Carob Bean Flour	lb.	——	.30
Casein	lb.	.32	.38
Emcol K-8300* (dms.)	lb.	.19	.20
Ethylene Diamine 68%	lb.	.44	.47
Gum Arabic	lb.	——	.19
Karaya Gum	lb.	——	.25
Locust Bean Gum	lb.	——	.31
Prosein*	lb.	——	.06
Stablex B*	lb.	.50	.95
K*	lb.	.27	.35

RECLAIMING AGENTS

Amalgamator Z-4*	lb.	.32	.33
Armeen C*	lb.	.45	.47
Mixed Crude*	lb.	.17	.23
T*	lb.	.29	.31
Burco RA*	lb.	.05½	.08¼
C-6 Oil* (28* & 32*)	gal.	.33	.38
C-10 Oil*	gal.	.25	.30
C-33* (t.c.)	gal.	——	.21½
C-42* (t.c.)	gal.	——	.23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	——	4.50
Liquid 50% (t.c.)	cwt.	——	2.80
Solid 76% (c.l., dms.)	cwt.	——	4.10
Cresylic Acid (99-100%)	gal.	.80	.94
D-4* (t.c.)	gal.	——	.27
E-5* (t.c.)	gal.	——	.25
Flake Calcium Chloride (77-80%)	ton	——	29.00
G.B. Reclaiming Oil*	gal.	.12	.18
CD-10*	gal.	.10	.16
CD-50-U*	gal.	.18	.24
Gensol No. 6* (t.c.)	gal.	——	.40
Heavy Aromatic Naphtha	gal.	——	.13¼
LX-77 Reclaiming Solvent*	gal.	.21	.33
LX-572 Reclaiming Oil*	gal.	.27	.32
LX-777 Reclaiming Oil*	gal.	.23	.33
Neo-Fat D-242*	lb.	.05½	.07¾
No. 517 H.B. Oil*	gal.	.11½	.16½
535*	gal.	.22	.27
PT 67 Light Pine Oil* (dms.)	gal.	——	.60
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	.0634
PT 150 Pine Solvents* (dms.)	gal.	——	.44
Q Oil* (t.c.)	gal.	——	.286
Reclaiming Oil 3186-G*	gal.	.25	.36½
Reclaiming Reagent No. 1431*	lb.	.21	.25
R.P.A. No. 3*	lb.	——	.47
RR-10*	lb.	——	.36
Soda Ash (c.l., bags)	cwt.	——	1.75
Solvent 534*	gal.	.20½	.26½
Solvent Oil 21*	gal.	.24	.29
C-42*	gal.	.23	.38
Union Solvent 4060-O*	gal	——	.184
X-1 Resinous Oil*	lb.	.0210	.0300

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REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0740	.1225
Continental F*	lb.	.0740	.1225
Croflex*	lb.	.0740	.1225
Dixiedensed (and S)*	lb.	.0740	.1225
HX HPC*	lb.	.0740	.1225
Kosmobile (and S)*	lb.	.0740	.1225
Micronex HPC*	lb.	.0740	.1225
Witco No. 6*	lb.	.0740	.1225

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0740	.1225
Atlantic MPC-95*	lb.	.0740	.1225
Collocarb*	lb.	——	.0625
Continental A*	lb.	.0740	.1225
Croflex TH*	lb.	.0740	.1225
Dixiedensed HM (and S-66)	lb.	.0740	.1225
Kosmobile HM (and S-66)	lb.	.0740	.1225
Micronex Standard*	lb.	.0740	.1225
Spheron 6*	lb.	.0740	.1225
Texas M*	lb.	.0740	.1225
Witco No. 1*	lb.	.0740	.1225

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0740	.1225
Collocarb*	lb.	——	.0625
Continental AA*	lb.	.0740	.1225
Croflex 77*	lb.	.0740	.1225
Dixiedensed 77*	lb.	.0740	.1225
Kosmobile 77*	lb.	.0740	.1225
Micronex W-6*	lb.	.0740	.1225
Spheron 9*	lb.	.0740	.1225
Texas E*	lb.	.0740	.1225
Witco No. 12*	lb.	.0740	.1225
Wyex EPC*	lb.	.0740	.1225

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2400	.3200
Dixie 5 Dustless*	lb.	.1200	.1900
Dixie Voltex*	lb.	.2400	.3200
Kosmink Dustless*	lb.	.1200	.1900
Kosmos Voltex*	lb.	.2400	.3200
Spheron C*	lb.	.1500	.1950
Voltex*	lb.	.2400	.3200

Channel, Surface Treated (STC) (bags)

Texas 109*	lb.	.0790	.1275

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0890	.1290
Shawinigan Acetylene Black*	lb.	.1700	.2600
Vulcan C*	lb.	.1050	.1500

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0600	.1000
Collocarb*	lb.	——	.0525
Coatinex FEF*	lb.	.0600	.1000
Croflex 50*	lb.	.0600	.1000
Dixie 50*	lb.	.0600	.1000
Kosmos 50*	lb.	.0600	.1000
Philblack A*	lb.	.0600	.1000
Statex M*	lb.	.0600	.1000
Sterling SO*	lb.	.0600	.1000

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0650	.1050
Sterling 99*	lb.	.0650	.1050

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0500	.0900
Dixie 35*	lb.	.0500	.0900
Kosmos 35*	lb.	.0500	.0900
Sterling V*	lb.	.0500	.0900
V (Non-Staining)	lb.	.0500	.0900

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0740	.1140
Continex HAF*	lb.	.0740	.1200
Croflex 60*	lb.	.0740	.1140
Dixie 60*	lb.	.0740	.1140
Kosmos 60*	lb.	.0740	.1140
Philblack O*	lb.	.0740	.1140
Statex R*	lb.	.0740	.1200
Vulcan 3*	lb.	.0740	.1140

Furnace, High Modulus (HMF) (bags)

Collocarb*	lb.	——	.0525
Continex HMF*	lb.	.0550	.0950
Croflex 40*	lb.	.0550	.0950
Dixie 40*	lb.	.0550	.0950
Kosmos 40*	lb.	.0550	.0950
HMF*	lb.	.0550	.0950
Modulex HMF*	lb.	.0550	.0950
Statex 93*	lb.	.0550	.0950
930*	lb.	.0470	.0870
Sterling L*	lb.	.0550	.0950
LL*	lb.	.0550	.0950

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Furnace, Semi-Reinforcing (SRF) (bags)

Collocarb*	lb.	——	.0400
Continex SRF*	lb.	.0450	.0850
Croflex 20*	lb.	.0475	.0875
Dixie 20*	lb.	.0475	.0875
Essex SRF*	lb.	.0475	.0875
Furnex*	lb.	.0475	.0875
Gastex*	lb.	.0525	.0925
Kosmos 20*	lb.	.0475	.0875
Pelletex*	lb.	.0475	.0875
NS*	lb.	.0475	.0875
Shawinigan Acetylene Black*	lb.	.1700	.2600
Sterling NS*	lb.	.0475	.0875
R*	lb.	.0525	.0925
S*	lb.	.0475	.0875

Furnace Super Abrasion (SAF) (bags)

Philblack E*	lb.	.1250	.1650
Vulcan 9*	lb.	.1250	.1650

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0900	.1300
Continex ISAF*	lb.	.0900	.1350
Dixie 70*	lb.	.0900	.1350
Kosmos 70*	lb.	.0900	.1350
Philblack I*	lb.	.0900	.1300
Statex 125*	lb.	.0900	.1350
Vulcan 6*	lb.	.0900	.1300

Furnace, Super Conductive (SCF) (bags)

Vulcan SC*	lb.	.1800	.2230

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	——	.0575
Sterling FT (c.l.)*	lb.	——	.0550

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	——	.0250
Sterling MT (c.l.)*	lb.	——	.0400
MT Non-Staining (c.l.)*	lb.	——	.0500
Thermax (c.l.)*	lb.	——	.0400
Stainless (c.l.)	lb.	——	.0500

REINFORCING AGENTS—SILICA

Cab-O-Sil (compressed)*	lb.	.68	.75
Cab-O-Sil (uncompressed)*	lb.	.68	.75
D. C. Silica (pelletized)*	lb.	1.45	1.65
Hi-Sil 101*	lb.	.10	.11½
233*	lb.	.09	.10½
X303*	lb.	.40	.45
Santocel*	lb.	.62	.64

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	——	.60
Darex Copolymer No. 3*	lb.	.47	.49
X34*	lb.	.42	.44
43G*	lb.	.39	.41
Darex Copolymer Latex No. 3-L (and X34L)*	lb.	.36½	.39
Durez 12687 (and 12707)*	lb.	——	.37
Durez 13355*	lb.	——	.28
Good-rite Resin 50*	lb.	.39	.41
Hystron*	lb.	.39	.41
Kralac A-EP*	lb.	.39	.41
Lampblack	lb.	——	.12
Marbon S and S-1*	lb.	.39	.41
8000*	lb.	.39	.41
Marmix*	lb.	.39	.41
Pliolite Latex 150*	lb.	.35	.39
Pliolite Resin-Rubber Masterbatches*	lb.	.33	.57
Pliolite NR*	lb.	.93	.95
S6B*	lb.	.39	.41
Plio-Tuf G85C*	lb.	.52	.54
Polyco 220*	lb.	.18¼	.19¼
Polypol S-70*	lb.	.22	.23

RETARDERS

Benzoic Acid TBAO-2*	lb.	——	.44
Dutch Boy Normasal*	lb.	——	.46
ESEN*	lb.	.35	.37
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder J*	lb.	.62	.64
PD*	lb.	.35	.37
W*	lb.	——	.45
Retardex*	lb.	.47	.50

RUBBER SUBSTITUTES

Mineral Rubber

Black Diamond*	ton	50.00	60.00
Byerlyte*	ton	50.00	57.00
Hard Hydrocarbon (dms.)*	ton	46.50	48.50
Herron Flake*	ton	——	45.00
Mineral Rubber, Solid	ton	42.50	44.50
M. R. No. 38*	ton	50.00	60.00

Vulcanized Vegetable Oils

Amberex*	lb.	.29	.36
Brown*	lb.	.1310	.2200
Car-Bel-Lite*	lb.	.3300	.3600
Neophax*	lb.	.1570	.2680
Polyrez A and C*	lb.	.12	.17
White*	lb.	.1480	.2520

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06	.06½
Gilsowax B*	lb.	.09	.11
Resin No. 1098 (dms.)	lb.	——	.62
No. 1198*	lb.	.46¾	.49¾
Tysonite*	lb.	.24	.24¾

SOLVENTS

Acetone (dlvd.)	lb.	.07	.10
Amsco Lactol Spirits* (t.c.)	gal.	——	.19
Naphthol Spirits*	gal.	——	.18
Mineral Spirits*	gal.	——	.17
Rubber Solvent* (t.c.)	gal.	——	.18
Solv A* (t.c.)	gal.	——	.24½
Solv A-80* (t.c.)	gal.	——	.30
Solv B* (t.c.)	gal.	——	.29½
Solv B-90* (t.c.)	gal.	——	.32
Solv D* (t.c.)	gal.	——	.30
Solv E*	gal.	——	.30
Solv F*	gal.	——	.30
Solv F-80*	gal.	——	.32½
Solv G*	gal.	——	.42½
Special Naphtholite* (t.c.)	gal.	——	.18
Special Textile Spirits*	gal.	——	.19
Super Hi-Flash Naphtha*	gal.	——	.45
Super Naphtholite*	gal.	——	.18
Textile Spirits* (t.c.)	gal.	——	.19
Amyl Chlorides, Mixed (l.c.l.) (dms.)	lb.	.09¼	.10¾
Benzol 90%	gal.	.36	.40
Butyl Acetate (t.c.)	lb.	.15	.16
Butyl Alcohol (t.c.)	lb.	.15	.16
Secondary (dlvd.)	lb.	.14	.15
Tertiary (dlvd.)	lb.	.14½	.15½
Carbon Bisulfide, Tech.	lb.	.05½	.07½
Carbon Tetrachloride	lb.	.09½	.12¾
Cosol 1*	gal.	.37	.43
2*	gal.	.42	.48
Cyclohexane	gal.	.55	.72
85% (c.l.) (dms.)	gal.	——	.54
Cyclohexanone	lb.	.32	.35
Diacetone, Pure (dlvd.)	lb.	.15	.16
Dichlorethyl Ether (dms.)	lb.	.14½	.15
Formal (dms.)	lb.	.30¾	.31¾
Dichloropentane	lb.	.04¼	.14¾
Dicom*	gal.	.30	.42
Halowax Oil*	lb.	.28	.41
Heptanes* (t.c.)	gal.	.17	.22
Hexanes (t.c.)	gal.	.17	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.57	.64
Ether, Ref. (dlvd.)	lb.	.07½	.08½
Mersol*	gal.	.43	.79
Mesityl Oxide (dlvd.)	lb.	.14	.15
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.57	.63
Methyl Chloride	lb.	——	.11½
Methyl Ethyl Ketone	lb.	.14	.15
Methyl Isobutyl Ketone (dlvd.)	lb.	.16	.17
Methylene Chloride	lb.	.11¼	.15
N-5 Pentane Mix* (t.c.)	gal.	——	.13½
N-6 Hexanes* (t.c.)	gal.	——	.14½
N-7 Hexanes* (t.c.)	gal.	——	.13½
Penetrell*	gal.	.40	.62
Perchlorethylene	lb.	——	.14
Petrolene* (t.c.)	gal.	——	.14125
Picolines, Alpha, Refined	lb.	.43½	.44
Mixed	lb.	——	.35
Proprietary Solvent (dms.)	gal.	.51	.72
Propyl Acetate (t.c., dlvd.)	lb.	——	.10¾
Alcohol (t.c., dlvd.)	lb.	——	.10
PT 150 Pine Solvent* (dms.)	gal.	——	.44
Pyridine, Refined	lb.	——	.75
Quinoline	lb.	.50	1.35
Rubber Solvent (t.c.)	gal.	——	.16
Rubsol (t.c.)	gal.	——	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	——	.158
C (Heptanes)* (t.c.)	gal.	——	.151
R (Rubber Solvent)*	gal.	——	1.29
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100* (t.c.)	gal.	.33	.37
150 (t.c.)	gal.	.33	.37
Sunny South DD Dipentine*	gal.	.40	.62
Sunny South DD Pine Oil*	lb.	.12¼	.14¼

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SOLVENTS (Cont'd)

Sunray*	gal.	.1140	.1600
Toluene (dms.)	gal.	—	.38
Toluol (t.c.)	gal.	—	.34
Trichlorethane	lb.	.13	.13½
Triglycol Dichloride	lb.	.63	.64
Union Thinner 1* (t.c.)	gal.	—	.172
5* (dms.)	gal.	—	.197
7* (t.c.)	gal.	—	.162
2-50 W Hi-Flash*	gal.	—	.41
Xylol	gal.	.34	.38

STABILIZING AGENTS (for Vinyl) Resins)

Advastab No. 21*	lb.	1.00	1.08
50-LT*	lb.	3.20	3.35
BC-105*	lb.	.75	.80
E-6-B*	lb.	.80	.85
L Paste	lb.	.65	.70
X23-74*	lb.	.70	.80
X30-15*	lb.	.65	.75
XE-82*	lb.	.85	.95
Barca 10*	lb.	.75	.80
Barium Ricinoleate (BVS)	lb.	—	.70
Barium Stearate	lb.	.39	.44
Basic Silicate White Lead	lb.	.20¾	.21¾
Cadmium Ricinoleate	lb.	—	2.00
Calcium Ricinoleate	lb.	—	.55
Dutch Boy DS-207*	lb.	—	.54
Plumb-O-Sil A*	lb.	—	.29¾
B*	lb.	—	.31¾
Tribase*	lb.	—	.26½
Dythal*	lb.	—	.39½
Ferro 182* (dms.)	lb.	.70	.76
200* (dms.)	lb.	1.33	1.43
203* (dms.)	lb.	.85	.95
541* (dms.)	lb.	.35½	.45½
541A* (dms.)	lb.	.81¾	.91¾
700* (dms.)	lb.	.48¾	.58¾
900* (dms.)	lb.	.90	1.00
903* (dms.)	lb.	.55	.65
909* (dms.)	lb.	.91	1.01
920*	lb.	—	.98
931* (dms.)	lb.	.75¾	.85¾
993* (dms.)	lb.	.89	.99
1203* (dms.)	lb.	1.30	1.40
1206* (dms.)	lb.	1.23	1.33
1820* (dms.)	lb.	.90	1.00
1825* (dms.)	lb.	1.00	1.10
Permyl A	lb.	.45	.55
Harshaw 1-V-3*	lb.	—	.43
1-V-4*	lb.	—	.68
1-V-7*	lb.	—	.66
2-V-4*	lb.	—	.85
2-V-7*	lb.	—	1.10
2-V-8*	lb.	—	1.30
5-V-1*	lb.	—	.41
7-V-1*	lb.	—	.90
8-V-1*	lb.	—	1.10
8-V-5*	lb.	—	.80
8-V-100*	lb.	—	.84
9-V-1*	lb.	—	.76
12-V-5*	lb.	—	.75
24-V-1*	lb.	—	1.28
28-V-2*	lb.	—	1.18
128-V-5*	lb.	—	.86
Lithium Stearate	lb.	.57	.62
Fluffy	lb.	.47½	.70
Standard	lb.	.52½	.75
Metasap 613-A*	lb.	—	.69
613-B*	lb.	—	.84
613-C*	lb.	—	1.06
621*	lb.	—	.88
624*	lb.	—	.75
633*	lb.	—	.75
635*	lb.	—	.45
Modicol N*	lb.	.41½	.42½
S*	lb.	.30½	.31½
Sodium Silicates 41°/1:32	cwt.	1.00	2.10
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XL*	lb.	.55	.65
HR-50*	lb.	.75	.90
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HR Paste*	lb.	.85	.95
HR Powder*	lb.	.95	1.05
No. 110 Liquid	lb.	.65	.75
No. 115 Liquid	lb.	.85	.95
No. 120 Liquid	lb.	.65	.75
Stabilizer No. 3*	lb.	1.90	2.00
No. 42*	lb.	.83	.93
No. 52*	lb.	1.90	2.00
No. 89X*	lb.	.75	.80
No. 143*	lb.	.80	.90
BC-12*	lb.	.87	.95
B-5*	lb.	—	.70
CH-14*	lb.	—	.65
CH-20*	lb.	—	.65
E6B*	lb.	—	.95
E-49*	lb.	—	.60
E-98*	lb.	—	.55
G-1*	lb.	1.25	1.40
HR*	lb.	.85	.89
JCX*	lb.	—	.63
L*	lb.	—	.60
M*	lb.	.68	.70
OM-10*	lb.	—	1.95
OM-18*	lb.	—	3.25
PL*	lb.	.63	.65
SN*	lb.	—	.48
V-1-N*	lb.	—	.43
VL-3*	lb.	—	1.00
XI*	lb.	.87	.90
XV*	lb.	.92	.94
XX*	lb.	.58	.60
Staflex OY*	lb.	1.00	1.20
QXMA*	lb.	—	.70

STABILIZING AGENTS (Cont'd)

Stayrite 10*	lb.	.32	.37
P-10*	lb.	.39	.44
15*	lb.	.53	.58
20*	lb.	.37	.42
22*	lb.	1.30	1.34
Stayrite 25*	lb.	.35	.40
70*	lb.	.68	.70
71*	lb.	.88	.90
75*	lb.	.68	.70
76*	lb.	.58	.60
80*	lb.	.68	.70
90*	lb.	.68	.70
95*	lb.	.68	.70
229*	lb.	.45	.50
Vanstay L*	lb.	.33	.35
H.T.*	lb.	.90	.92
S*	lb.	.63	.65

STIFFENING AGENTS

Neozone*	lb.	—	.80
Polyac*	lb.	—	1.80
Processing Stiffener 710*	lb.	—	.88
Solvitose HDF, H. C-S, T, and E*	lb.	.22	.25
Versatil Gum 8-E*	lb.	.15	.19

SUN CHECKING AGENTS

Allied AA-1144*	lb.	.23	.24
AA-1177*	lb.	.15½	.16½
Antisol*	lb.	—	.23
Antisun* (Chipped)	lb.	.15½	.17½
(Slabbed)	lb.	.15	.17
Heliozone*	lb.	.30	.31
Microflake*	lb.	.20	.24
NBC*	lb.	—	1.55
Ross Sunproofing Waxes*	lb.	—	.14
Sunolite*	lb.	.16	.22
127*	lb.	.16½	.20½
154*	lb.	.23	.25
Sunproof*	lb.	.31	.32
713*	lb.	.25	.26
Improved*	lb.	.25	.26
Super*	lb.	.40	.41
Jr.*	lb.	.20	.21
Tonox*	lb.	.52	.54

SURFACE ACTIVE AGENTS

Anhydrapent*	lb.	.56	.59
Anhydrol 6990*	lb.	.51	.56
6991*	lb.	.51	.56
Aquarex D*	lb.	—	.78
G*	lb.	—	.21
MDL*	lb.	—	.33
ME*	lb.	—	.80
NS*	lb.	—	.60
SMO*	lb.	—	.50
WAQ*	lb.	—	.22
Emulphor EL-620*	lb.	—	.40
EL-719*	lb.	—	.058
EL-870*	lb.	—	.055
Igepal CA-630	lb.	—	.29
CO-630	lb.	—	.29
CO-730	lb.	—	.29
CO-850*	lb.	—	.29
CO-880*	lb.	—	.29
Igepon CN-42*	lb.	—	.25
T-33*	lb.	—	.31
T-51*	lb.	—	.13½
T-77*	lb.	—	.49
Kessco 50201*	lb.	—	.43½
50203*	lb.	—	.44
18201*	lb.	—	.38
18203*	lb.	—	.35¾
Pluronic L62*	lb.	.33½	.39
L64*	lb.	.33½	.39
Sellogen Gel*	lb.	—	.12¾
Soybean Lecithin	lb.	.13	.17

TACKIFIERS

Amalgamator Z-4*	lb.	.32	.33
Arceo 620-32B*	lb.	.20½	.21
716-30*	lb.	.18½	.19
1041-21*	lb.	.16½	.17
Bunaweld Polymer No. 780*	lb.	—	.24
No. 5514*	lb.	—	.35
Galex* (dms.)	lb.	.15¾	.18
Indopol H-300*	gal.	1.00	1.22
Koresin*	lb.	—	.95
Liquid Rubber Flux*	lb.	—	.14
Nacconal NRSF* (dlvd.)	lb.	.40½	.45
Nilox* (c.l.)	cwt.	—	14.50
Resin V	lb.	—	.23½
Synthol*	lb.	—	.24¾
Tackifier 1041-21*	lb.	.16½	.17½
Vistac No. 1*	gal	1.00	1.21
A*	lb.	.21½	.22¼
Zirex* (c.l.)	cwt.	—	14.75

THICKENERS (For Latex)

Alcogum AN-6*	lb.	—	.05
AN-10*	lb.	—	.08½
Betanol* (dms.)	lb.	.70	.95
Gomme Labolene*	lb.	.45	.47
Good-rite K-702*	lb.	.34½	.35
K-704*	lb.	.21	.22
K-705*	lb.	.31	.32
K-707*	lb.	.18	.19
K-708*	lb.	.29	.30
K-710*	lb.	.15	.16
Modicol VD*	lb.	.13½	.14½
VE*	lb.	.13½	.14½
Polyco 296 BT*	lb.	.15	.16
296-N*	lb.	.15	.16
530*	lb.	.15	.16

THICKENERS (For Latex) (Cont'd)

Propylene Laurate (dms.)	lb.	.57	.82
Sodium Silicate, 41°/1:3.2	cwt.	1.00	2.10
Solvitose Series*	lb.	.22	.25

VULCANIZING AGENTS

Selenium

Vandex*	lb.	—	15.50

Sulfur

Aero Brand*	cwt.	—	2.40
Blackbird* (c.l.)	cwt.	—	2.85
Cloud* (c.l.)	cwt.	—	2.80
Crystex*	lb.	.19½	.23
Darex Dispersed Sulfur*	lb.	.14	.16
Devil A* (c.l.)	cwt.	—	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60*	lb.	.12½	.13
Ko-Blend IS*	lb.	—	.39
Mist* (Wettable) (c.l.)	cwt.	—	4.00
Spider* (c.l.)	cwt.	—	2.80
Star* (c.l.)	cwt.	—	3.25
Sulfasan R*	lb.	—	1.50
Tire* (c.l.)	cwt.	—	2.40
Tube* (c.l.)	cwt.	—	3.25
Vultac 2*	lb.	.47	.49
3*	lb.	.51	.53

Tellurium

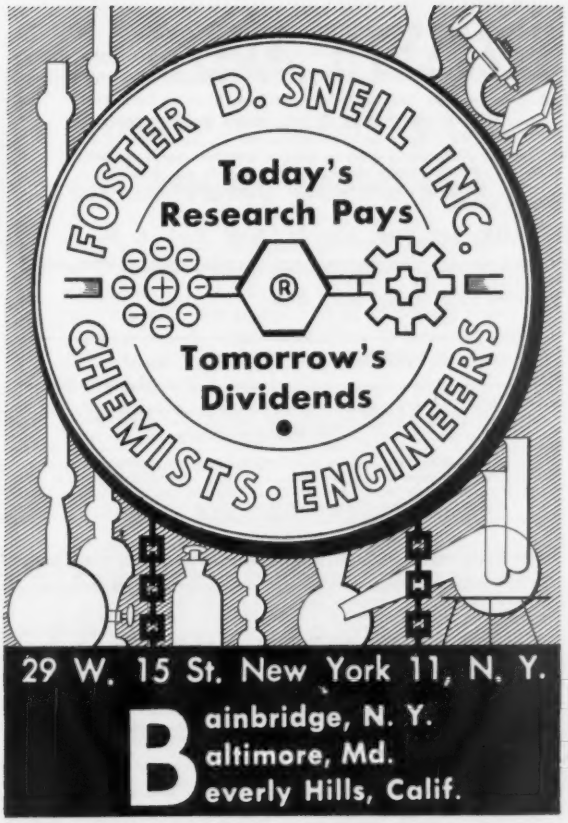
Telloy*	lb.	—	2.50

WETTING AGENTS

Advawet No. 10*	lb.	—	.20
No. 33*	lb.	—	.48
Aerosol 18*	lb.	—	.40
AY*	lb.	1.00	1.20
MA 80%*	lb.	.67	.72
OS*	lb.	.39	.45
OT 75% Aqueous*	lb.	.63	.68
OT 100%*	lb.	1.00	1.20
OT-B*	lb.	.85	1.05
Alrosal* (dms.)	lb.	—	.40
Alrosperse*	lb.	—	.18
Anhydrol 6990* and 6991*	lb.	.51	.56
Areskap 50*	lb.	.30	.38
Dry 100*	lb.	.60	.72
Aresket Dry 300*	lb.	.60	.72
Aresklene 375*	lb.	.42	.57
Armacs*	lb.	.28	.77
Arquads*	lb.	.24	.60
Emcol 5100* (dms.)	lb.	—	.30
5130* (dms.)	lb.	—	.30
Etho-Chemicals*	lb.	.26	.58
Kesco E-122* (dms)	lb.	—	.45
18201*	lb.	—	.38
Krelson 8G* (dms.)	lb.	.26	.32
Kyro EO* (dms.)	lb.	—	.29¾
Modicol N*	lb.	.41½	.42½
S*	lb.	.30½	.31½
Nacconol SL* (dlvd.)	lb.	.084	.10
60S* (dlvd.)	lb.	.19	.225
Naccosol A* (dlvd.)	lb.	—	.52
Orvus AB Granules*	lb.	.15¾	.16¾
Parnol*	lb.	.13	.18
Santomerse D*	lb.	.44	.65
S*	lb.	.13	.25
Selapon Gel*	lb.	—	.13
Sorapon SF-73*	lb.	—	.18
SF-78*	lb.	—	.30
Sorbit P*	lb.	—	.28
Soybean Lecithin	lb.	.13	.17
Stablex G*	lb.	.50	.90
Tergitol 4* (dms., dlvd.)	lb.	.32	.33
7* (dms., dlvd.)	lb.	.43	.44
O8* (dms., dlvd.)	lb.	.31	.32
P28* (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	—	.15
Vultamol*	lb.	—	.17½
Wetsit Conc.*	lb.	.25	.28

MISCELLANEOUS CHEMICALS

Aquesperse 30*	lb.	—	.11
Arccopel W-18*	lb.	.17	.19
Asbury Graphite*	lb.	.05	1.45
Copper Inhibitor X-872-L*	lb.	—	2.01
D-Tac*	lb.	—	.22
2-Ethyl Hexanol	lb.	.23¾	.24¼
Fura-Tone Resin 1226*	lb.	.41	.43
HB-20*	lb.	.15	.17
HB-40*	lb.	.19	.22
MODX*	lb.	.32½	.34½
BF*-13	lb.	—	.26½
Nacconate 65* (dms.)	lb.	1.20	1.23
80* (dms.)	lb.	1.20	1.23
100* (dms.)	lb.	1.30	1.33
200* (dms.)	lb.	2.00	2.03
300* (dms.)	lb.	3.50	3.53
Para Resin 2457*	lb.	.04	.04½
2702*	lb.	.04	.04½
2718*	lb.	.04	.04½
Rio Resin*	lb.	.60	.62
Rongalite CX*	lb.	—	.21½
Sherosope F*	lb.	.15½	.17¾
F-455*	lb.	.13½	.15¾
L*	lb.	.14	.16¼
N*	lb.	.15	.17¼
T*	lb.	.16½	.18¾
Sublac Resin PX-5*	lb.	.23½	.24½
Sulfasan R*	lb.	—	1.50
Synpep*	lb.	.54	.60
Thiokol LP-2*	lb.	.96	1.06
LP-3, LP-32, LP-33*	lb.	.96	1.06
LP-8*	lb.	1.25	1.35
Tysonite*	lb.	.24	.24¼
VA-7*	lb.	.50	.60
Vanfre*	gal.	2.50	3.00



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Chemist or Chemical Engineer with experience or interest in adhesives or allied materials—rubbers, resins, etc.—needed for adhesives research and development assignment in Lancaster, Pennsylvania. Write giving age, experience, education, salary needs to Personnel Administration Department, ARMSTRONG CORK COMPANY, Lancaster, Pennsylvania.

RUBBER CHEMIST: Midwest "O" Ring and Packing manufacturer needs experienced rubber chemist over 30 to head small research, development and control laboratory. Will plan, direct, and conduct research projects on new or present rubber products. Must be able to lead and inspire group successfully. Salary commensurate with responsibility. Reply fully. Address Box 609-W, RUBBER AGE.

HELP WANTED—Continued

LATEX CHEMIST familiar with latex compounding for coagulant dipping process and having experience in development work. Send complete details ELASTOMERS, INC., P. O. Box 1750, Fort Myers, Florida.

Well established expanding company in pleasant surroundings needs a rubber chemist experienced in formulating and compounding natural and all synthetic rubber polymers, preferably in wire and cable industry. Must be willing and able to trouble shoot in production. Submit resumé of experience and salary requirements with first letter. Address Box 610-W, RUBBER AGE.

RUBBER CHEMIST with experience in the development and processing of GR-S and neoprene compounds used in the manufacture of wire and cable. New York area. State age, experience and salary requirement. Address Box 616-W, RUBBER AGE.

TAPE CHEMIST to head up development and control of manufacturing processes on pressure sensitive tapes, with primary emphasis on vinyl supported adhesive tapes. Applicant should hold C.E. or B.S. degree, and have at least 2 yrs. experience in this field. Write giving full details of experience, salary, etc. This is a sound, long range program with old established company. No price—firmly established—but salary will be commensurate with ability. Address Box 618-W, RUBBER AGE.

RUBBER CHEMIST OR COMPOUNDER

Preferably with rubber flooring and slab sole stock experience. Knowledge of vinyl compounding and processing would be desirable. Must be willing to relocate. Give complete biography, references and salary requirements. Address Box 625-W, RUBBER AGE.

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Manager for small Mid-west Mechanical rubber plant. Must know formulation, and must be cost and production minded. Definite proof of successful managerial ability essential. Salary open for discussion.

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TOP LEVEL TIRE MANUFACTURING SUPERINTENDENT:

Large Midwest plant has excellent opportunity for man whose training and experience qualify him as Tire Manufacturing Superintendent. Applications confidential. State age, experience, other pertinent information. Suggest recent photograph.

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New mechanical goods division manufacturing Cork-Neoprene Gaskets, molded and extruded wants chemist with 3 to 5 years' experience in rubber compounding; one who is willing to grow with the company as it expands. This man will assume full responsibility for compounding; also set up and direct all laboratory and production controls and procedures. Unusual opportunity for right man. Plant located in New Jersey 15 minutes from New York. Send resumé and salary desired. Replies confidential.

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WANTED: 20″ or 24″ 3 Roll Calender with or without drive, good condition. Address Box 608-E, RUBBER AGE.

WANTED: Used tensile machine for testing rubber compounds. Address Box 621-E, RUBBER AGE.

WANTED
Rubber Band Cutter
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MISCELLANEOUS

FOR SALE: "Rubber Chemistry and Technology," complete set, Vol. 1, #1, 1928 through Vol. 28, #4, 1955. Perfect condition. Address Box 620-M, RUBBER AGE.

EQUIPMENT FOR SALE

HYDRAULIC PRESSES

R. D. Wood 2500 ton, 8-opening, 84″ x 54″ steam platens.
Elmes 1000 ton hobbing, M. D. pump.
Birdsboro 882 ton, down-acting, 48″ x 48″ bed, self-contained.
HPM 750 ton, down-acting, 59″ x 44″ bed, self-contained.
Farrel 625 ton, 52″ x 52″ platens, self-contained.
Watson-Stillman 600 ton, hobbing, M. D. pump.
Farrel 393 ton, 2-opening, 48″ x 48″ steam platens.
Elmes 350 ton, down-acting, 30″ x 36″ bed, self-contained.
Lake Erie, 215 ton, 36″ x 36″ platens, self-contained, semi-automatic (4).
Lake Erie, 300 ton, 30″ x 30″ platens, self-contained, semi-automatic.
Carey 150 ton, 21″ x 16″ platen, adj. DLO 8″-28″ (3).
Farquhar 100 ton, down-acting, 30″ x 28″ bed, self-contained.
Farquhar 100 ton, drawing, down-acting, 29″ x 34″ bed, high speed, self-contained.
HPM 100 ton, fastraverse, down-acting, 30″ x 30″ bed, self-contained.
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Dake 75 ton die tryout press, practically new.
Watson-Stillman and Elmes 30 ton and 20 ton lab presses.
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Reed-Prentice, 12 oz., 1952 machine.
HPM 200-H-9, 9 oz. (2).
Reed-Prentice, 8 oz.
Impco, 8 oz., vertical, model VF-8, late model.
Watson-Stillman, 2 oz.
Van Dorn, model H-200, 1 oz. and 2 oz.

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FOR SALE: 1—new 3-roll 6" x 16" laboratory calender, m.d.; 1—Ball & Jewell rotary cutter, Model O, m.d.; 1—6" x 12" laboratory mill, m.d.; 2—Baker-Perkins size 15, 100-gallon jacketed mixers; 5—horizontal dry powder ribbon mixers, 400#, 1500#, 500#; 1—Fitzpatrick "D" comminutor, s.s. contact parts jacketed; 1—Mikro-Pulverizer #2TH, with motor; 4—Reed-Prentice & WS injection molding machines, two 16 oz.; also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. WANTED: Your Surplus Rubber Machinery. CONSOLIDATED PRODUCTS COMPANY, INC., 70 Bloomfield St., Hoboken, N. J. HOboken 3-4425; N. Y. Phone: BArclay 7-0600.

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FOR SALE: 4—336 cu. ft. (12,000#) Sprout Waldron Spiral Ribbon Mixers. 2—W & P 100 gal. Sigma Blade Jacketed Mixers. 2—Day 75 gal. stainless steel Sigma Blade Jacketed Mixers. 3—Read 50 gal. 30 HP Sigma Blade Jacketed Mixers. Fitzpatrick Comminuting machines, models D, K & F. Mikro Pulverizers #2TH, #2DH, #3TH. Large stock steel and stainless steel kettles. We need your surplus equipment. PERRY EQUIPMENT CORP., 1409 No. 6th Street, Philadelphia 22, Penna.

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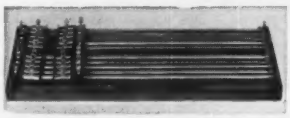

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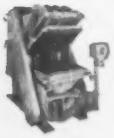

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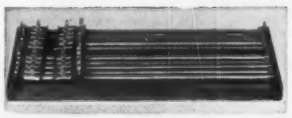

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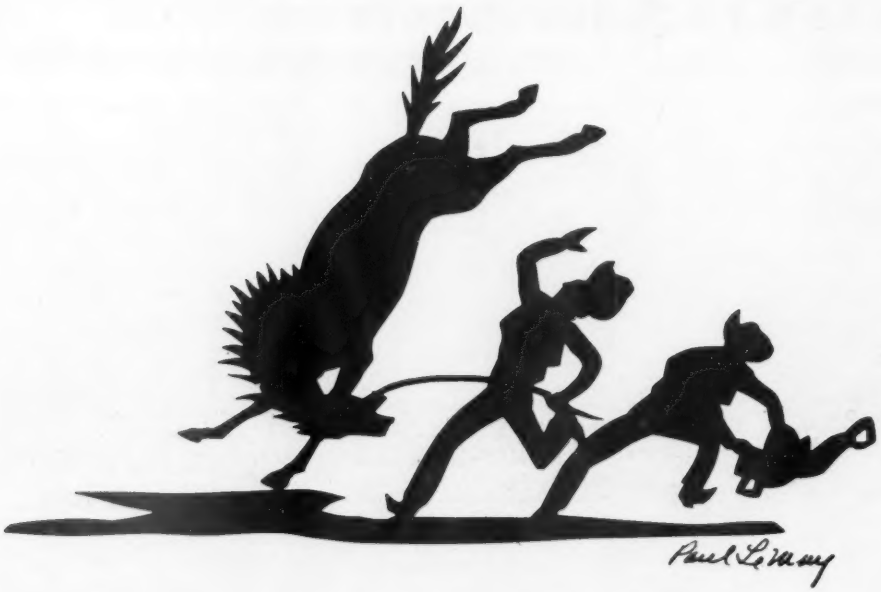

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